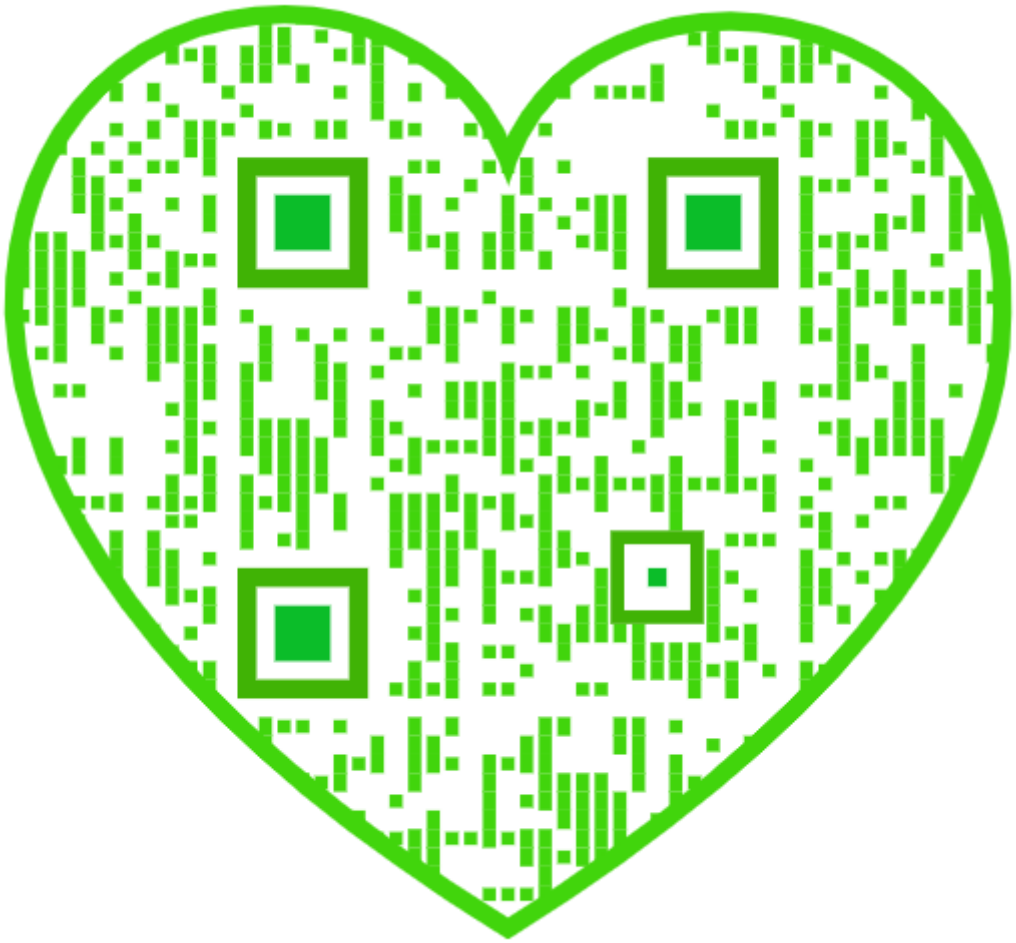

TRANSACTIONS OF THE

SECTION ON

Obstetrics, Gynecology and Abdominal Surgery

of the
American Medical Association
at the Seventy-Second Annual
Session, held at Boston, Mass.,
June 6 to 10, 1921

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The officers named below served this Section. That division of practice included under the title of "Obstetrics and Gynecology" was formerly included with branches which now comprise separate sections. The names have been taken from the published records, which are deficient in some cases. It will be appreciated if any additional data are brought to the attention of the Secretary of the American Medical Association.

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PROCEEDINGS OF THE SECTION

WEDNESDAY, JUNE 8.—MORNING

The section was called to order at 9 o'clock by the chairman, Dr. John O. Polak, Brooklyn.

Dr. J. Wesley Bovée, Washington, D. C., was appointed by the chairman to take the place of Dr. Reuben Peterson, Ann Arbor, Mich., on the Executive Committee.

The following papers were read as a symposium on "Cancer of the Uterus":

Dr. Henry Schmitz, Chicago: "The Treatment of Cancer of the Uterus."

John G. Clark and Dr. Floyd E. Keene, Philadelphia: "Ultimate Results of Radium Treatment in Three Hundred Cases of Cancer of the Uterus."

Dr. Rex Duncan, Los Angeles: "Radium Treatment of Cancer of the Uterus."

These three papers were discussed by Drs. William P. Graves, Boston; A. J. Ochsner, Chicago; Fred T. Taussig, St. Louis; Henry O. Marcy, Boston; Henry Schmitz, Chicago; Floyd E. Keene, Philadelphia, and Dr. Rex D. Duncan, Los Angeles.

Dr. William J. Mayo, Rochester, Minn., read a paper on "The Relation of the Spleen to the Anemias." Discussed by Drs. A. J. Ochsner, Chicago, and William J. Mayo, Rochester, Minn.

Dr. Frederick J. Taussig, St. Louis, read a paper entitled "In What Cases do Uterine Fibroids still Require Operative Removal?" Discussed by Drs. George G. Ward, Jr., New York; William J. Mayo, Rochester, Minn.; Henry O. Marcy, Boston, and Frederick J. Taussig, St. Louis.

Dr. George G. Ward, Jr., New York, moved that the section recommend to the Association the election of Dr. W. Blair Bell of Liverpool, England, to honorary fellowship. Motion seconded by Dr. Frederick J. Taussig, St. Louis, and unanimously carried.

Dr. Edward P. Davis, Philadelphia, read a paper on "Treatment of the Early and Late Toxemia of Pregnancy." Discussed by Drs. G. G. Copeland, Toronto, Canada; W. M. Brown, Rochester, N. Y.; Carl H. Davis, Milwaukee, and Edward P. Davis, Philadelphia.

Dr. Thomas J. Watkins, Chicago, read a paper on "The Treatment of Suppurative Abdominal Wounds by the Closed Method." Discussed by Drs. Richard R. Smith, Grand Rapids, Mich.; Charles T. Souther, Cincinnati; Hugo Ehren-

fest, St. Louis; George E. Shoemaker, Philadelphia; W. M. Brown, Rochester, N. Y., and Thomas J. Watkins, Chicago.

Dr. Robert E. Farr, Minneapolis, read a paper on "Similarity of the Demands of Local Anesthesia and the Patient's Best Interests." Discussed by Drs. Charles T. Souther, Cincinnati, and H. P. Newman, San Diego, Calif.

Thursday, June 9—Morning

Dr. John O. Polak, Brooklyn, read the chairman's address, entitled "Our Defects in Obstetric Teaching."

Dr. W. Blair Bell, Liverpool, England, read a paper on "The Surgical Treatment of Lesions in the Internal Genital Organs Associated with Chronic Infections." Discussed by Drs. C. Jeff Miller, New Orleans; Arthur H. Curtis, Chicago; Sidney A. Chalfant, Pittsburgh; Gordon G. Copeland, Toronto, Canada; Henry Schmitz, Chicago, and W. Blair Bell, Liverpool, England.

Drs. Edward Reynolds and Donald Macomber, Boston, presented a paper on "Defective Diet as a Cause of Sterility—A Study Based on Feeding Experiments with Rats." Discussed by Drs. Edward Reynolds, Boston; W. Blair Bell, Liverpool, England; Albert J. Ochsner, Chicago; Emil Novak, Baltimore, and Donald Macomber, Boston.

Dr. Charles G. Heyd, New York, read paper on "Cholecystogastrostomy and the Courvoisier Gallbladder." Discussed by Drs. John B. Deaver, Philadelphia; E. Starr Judd, Rochester, Minn.; Moses Behrend, Philadelphia; John J. Gilbride, Philadelphia, and Charles G. Heyd, New York.

Dr. Alexius McGlannan, Baltimore, read a paper on "Blood Pressure Changes During Abdominal Operation." Discussed by Dr. Bertram M. Bernheim, Baltimore.

Dr. Addison G. Brenizer, Charlotte, N. C., read a paper on "The Relation Between the Thyroid Gland and the Female Generative Organs: Specifically the Ovaries." Discussed by Drs. E. Starr Judd, Rochester, Minn., and Emil Novak, Baltimore.

Dr. Carey Cubertson, Chicago, read a paper on "The Use of the Sigmoid Flexure and Cecum in Pelvic Peritonization." Discussed by Drs. Carl B. Davis, Chicago, and Carey Culbertson, Chicago.

Friday, June 10—Morning

The following officers were elected: chairman, Dr. Sidney A. Chalfant, Pittsburgh; vice chairman, Dr. Gordon K. Dickinson, Jersey City, N. J.; secretary, Dr. Carl H. Davis, Milwaukee; nominees for board of governors of the American College of Surgeons, Drs. Floyd E. Keene, Philadelphia; Robert E. Farr, Minneapolis, and Carey Culbertson, Chicago; delegate, Dr. George G. Ward, Jr., New York; alternate, Dr. Frederick J. Taussig, St. Louis.

Dr. Alfred C. Beck, Brooklyn, read a paper on "End-Results of Prenatal Care." Discussed by Drs. Joseph B. De Lee, Chicago; Edward A. Schumann, Philadelphia; Hugo Ehrenfest, St. Louis, and Alfred C. Beck, Brooklyn.

Dr. Edward A. Schumann, Philadelphia, read a paper on "Observations on the Differential Diagnosis of Extra-Uterine Pregnancy with a Special Reference to Ovarian and Tubal Hemorrhage Not Associated with Pregnancy." Discussed by Drs. Emil Novak, Baltimore; Albert Goldspohn, Chicago, and Edward A. Schumann, Philadelphia.

Dr. Gordon G. Copeland, Toronto, Canada, read a paper on "Transperitoneal Cesarean Section: Copeland Technic." Discussed by Drs. Wilber Ward, New York; W. M. Brown, Rochester, N. Y.; P. B. Salatich, New Orleans; Joseph B. De Lee, Chicago, and Gordon G. Copeland, Toronto, Canada.

Dr. Hugo Ehrenfest, St. Louis, read a paper on "The Problem of Intracranial Hemorrhage of the New-Born from the Standpoint of the Obstetrician." Discussed by Drs. Isaac A. Abt, Chicago; H. Schwartz, New York; W. M. Brown, Rochester, N. Y.; Joseph B. De Lee, Chicago; Gordon G. Copeland, Toronto, Canada, and Hugo Ehrenfest, St. Louis.

Dr. Harvey B. Matthews, Brooklyn, read a paper on "Pregnancy After Nephrectomy." Discussed by Drs. John P. Polak, Brooklyn; Gordon G. Copeland, Toronto, Canada, and Harvey B. Matthews, Brooklyn.

Dr. Franklin A. Dorman, New York, read a paper on "Puerperal Breast Infections." Discussed by Dr. Howard T. Swain, Boston, and Franklin A. Dorman, New York.

Dr. Walter W. Manton, Detroit, read a paper on "Puerperal Anemia." Discussed by Drs. George R. Minot, Boston, and Walter W. Manton, Detroit.

THE DEFECTS IN OUR OBSTETRIC TEACHING*

JOHN OSBORN POLAK, M.D.
BROOKLYN

It has been customary for years that the chairman shall make an inaugural address before he can preside over your deliberations. But this year, owing to the fulness of the program and the desire of many of our distinguished Fellows to be placed on the first day of the session, the chairman's address has been put in as an after thought; but before proceeding with the subject which I have selected as my theme, allow me to express to you my deep appreciation of the honor you conferred upon me when you selected me to preside at this year's meeting as chairman of this important section. This honor falls to but few, but it is a distinction which carries with it its burdens and responsibilities. The work of this section in reality represents the advances made in our specialty in America, for we number among our members the Fellows of three national special societies; hence, as one looks over the transactions, he cannot help but be impressed with the merit of the work done and the seriousness of the contributors.

My illustrious predecessors, among whom may be numbered some of the leaders in obstetrics, gynecology and abdominal surgery, have blazed a trail which is no easy one to follow. Of the burdens and responsibilities which are placed upon the chairman, none is more difficult for me than that of making a formal address. I am going to have the temerity however, to call to your

* Chairman's address.

attention one of our sins of omission i. e.; the defects in our better obstetric teaching.

Advances in medicine and surgery, in better diagnosis, preventive medicine and improved surgical technic, have reduced the mortality of typhoid fever, diphtheria, pneumonia, intestinal perforations, appendicitis, cholecystitis and numberless other acute and subacute conditions to an almost irreducible minimum. Contrast this with the fact that the number of women who die from childbirth is increasing from year to year and that puerperal septicemia seems to be the only form of wound infection the occurrence of which has remained totally unaffected in the past decade by the advancement of scientific knowledge. In New York City on the island of Manhattan, last year one mother died for every 205 babies born, while in the greater city of New York, one woman in every 250 deliveries died from infection or as an indirect result of it. The mortality from puerperal infection remains practically the same today as it was in 1900; and the mortality from childbirth is second only to that from tuberculosis in women of reproductve age, and between 40 and 50 per cent. of these deaths are due to sepsis. Furthermore, consider the fetal mortality: One baby out of every twenty-one is born dead, and one out of every twenty-six dies before it is a month old.

More than 61 per cent. of all gynecologic surgery is the direct result of poor obstetric practice. This great wastage of human life, this consequent invalidism in those who survive their infection and trauma is absolutely preventable; hence I feel that this subject is worthy of consideration by such a representative body as this.

What are the reasons for this wastage of human life? It does not occur in the well managed obstetric clinics where the patient is given the benefit of proper and painstaking prenatal care and of good obstetric judgment. Why, then, is it necessary in every-day

obstetric practice? Why should the mortality from childbirth place the United States fourteenth on the list among sixteen leading civilized nations?

REASONS FOR MORTALITY FROM PUERPERAL INFECTION

In looking over the causes which contribute to this frightful mortality, I have first of all considered the teaching that is given to the students in our medical schools. Investigation shows that the didactic instruction is excellent and is fairly uniform; but, owing to the inadequate facilities for clinical observation which are available in the majority of schools, and the fact that both the profession and the laity continue to consider parturition as a normal process, the student often goes out with the impression that, because he has passed his examinations, he is competent to attend any woman in labor. This is not so any more than that he is competent to open the abdomen without previous special training. Unfortunately, there is no law other than his own conscience which governs his decision as to how far he can go in the management of the particular care.

The average graduate has been drilled in mensuration, abdominal diagnosis, watching the progress of normal labor, ausculatation of the fetal heart, and in aseptic technic. He is a fair male midwife, nothing more. He is capable of delivering multiparas with ample pelves, and this he can safely do provided he is conscientious in his asepsis. If he is not, the woman is far safer to be confined without the presence of a physician than to have one who introduces bacteria from without.

Another reason why infection and invalidism follow so frequently in the train of parturition is an apparent lack on the part of the practitioner, as well as on the part of some specialists, of an appreciation of the actual physiology of pregnancy and the several stages of labor.

This whole process has been fortified by every factor that Nature can place there to prevent sepsis and to accomplish delivery without injury to the child or the maternal soft parts; yet failure to observe the steps of this physiologic process is of daily occurrence.

PHYSIOLOGIC PROTECTIONS AGAINST INFECTION

Certain obstetric truths cannot be too often repeated; hence, with the full knowledge that I am making statements that are known to you all, I am going to show how Nature has fortified the individual against infection in the normal course of labor.

First, the secretions of the normal pregnant woman are antagonistic to pathogenic bacteria, and during the latter weeks of pregnancy and until labor has actually begun there is a tenacious plug of mucus in the cervix which stands as a barrier between the infected portion of the vagina and cervix, and the sterile uterine cavity. Not until labor actually begins is this plug passed, and then the membranes become the barrier to invasion from below. The membranes have another function, and that is their hydrostatic action, which not only protects the child from uterine compression, but effaces, obliterates and dilates the cervix by a series of equable pressures which minimize the trauma to which this part of the uterus must be subjected. Only by their preservation can the integrity of the cervix be preserved and trauma minimized, which insures better tissue resistance; later, as the membranes rupture and the liquor amnii escapes, it carries with it and before it the bacteria which have reached the portio and entered the cervical canal. After the cervix has become sufficiently dilated to permit the passage of the child, the fetus comes through the cervicovaginal canal, pushing everything before it, practically scrubbing the surface as it goes. The escape of the fetus is followed by a gush of hind-waters which further washes the canal from above downward, and this in turn is followed by the separa-

tion and expulsion of the placenta, which turns itself inside out through the ruptured membranes, thus keeping everything clean behind it. Furthermore, Nature has added the protection of a bactericidal quality to the lochia, during the first twenty-four hours postpartum, while the uterus is contracting and retracting and closing the uterine sinuses.

No one can study these physiologic processes without being impressed with the natural precautions which are afforded the woman against infection from without. Yet practitioners feel that they can anticipate these normal processes—artificially dilate the cervix, prematurely rupture the membranes, traumatize the soft parts, expedite labor by forceps or version, reduce the natural resistance, and carry bacteria from the unsterile into the sterile zone without getting a resulting morbidity.

OBSTETRIC SURGERY

Every year some of our great teachers present and advocate before a body of specialists some method to shorten the process of labor, relatively safe in their hands, but dangerous in the hands of those less skilled; for meddling in midwifery costs numberless lives. *These suggestions appeal to the busy practitioner, yet were never intended for his practice. The time to* recognize abnormalities, disproportions and complications is before they occur, in order that proper preventive treatment can be instituted.

The surgeon does not open the abdomen with a jackknife which he takes out of his pocket: he prepares his field of operation, his instruments and his hands. He takes care to repair the damage he has done by controlling his hemorrhage, coaptating the edges of his wound because the quality of his work is judged by the result which the patient can see; but so far as my investigation has gone, no obstetric condition is so formidable that the practitioner will not make a try at it at least. This is because he has not been taught, and

the public has not as yet recognized that obstetrics is a specialty—that the obstetrician must be an obstetric surgeon, who has had a training in the fundamentals of the science and the art of obstetrics, general and special diagnosis and an appreciation of the principles underlying obstetric surgery. To entitle him to be considered as a specialist he has to produce a living child which has a reasonable certainty of life, and a mother who recovers without morbidity, and is restored functionally and anatomically to as perfect a state as she was in before she was delivered.

That this is not being done is shown by the registered areas of the United States, which show that there has been a definite increase in the mortality from childbirth from 1902 to 1919. There have been approximately three times as many deaths from sepsis, four times as many deaths from eclampsia, and twice as many from other obstetric causes as there were seventeen years ago; besides the hundreds that die annually as the indirect results of labor from injuries, and the consequent operations for their repair, from nephritis which originated during pregnancy, and from endocarditis which has been aggravated by repeated labors.

PRENATAL CARE

I feel that it is time that the public be taken into our confidence and taught what can be done by prenatal care and proper and clean obstetrics; for good obstetrics would go far toward removing the horrors of childbirth and the consequent dread of invalidism. Prenatal care is the right of every prospective mother. Prenatal investigation permits us to discover syphilis, prevents the occurrence of eclampsia, allows the recognition of malpositions, and thus minimizes the difficulties of labor.

From the foregoing statements, which are facts, it is evident that our obstetric teaching is defecttive. There should be more uniformity in the teaching of the fun-

damentals of obstetrics and the principles that are generally accepted. Greater emphasis should be laid upon the responsibility of the obstetrician for the lives of both mother and child; and in order to turn out men who are even qualified to attend a primipara in labor, there must be greater clinical facilities for instruction of our students.

It does no good to say that the size of the classes should be reduced, when there is a constant cry for more and more physicians. The facilities must be increased.

Millions are expended every year for research and laboratories, but almost nothing is given to the establishment and maintenance of properly equipped maternity hospitals. Why, if it is necessary for the American College of Surgeons to require an apprenticeship in surgery before a man can be recognized as capable of doing a surgical operation, is it not just as necessary that the man who is to deliver a woman should have sufficient training to insure a satisfactory recovery, and a live baby?

Too little prenatal care is given to the average woman. The responsibility of the physician is underestimated, while he overestimates his abilities.

It will take a great deal of education of the student, the physician and the laity to change existing conditions; and as I look over the field, I have become more and more convinced that the demand of better work, which means longer apprenticeship, must come from the people, for it is they who are the losers. It is they who sustain the economic loss by invalidism, and it is they who must either directly or indirectly contribute the funds to maintain maternity hospitals, of adequate size to serve the community and instruct practitioners.

20 Livingston Street.

THE TREATMENT OF CANCER OF THE UTERUS

HENRY SCHMITZ, A.M., M.D.
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The objects of this study are to discuss the prophylaxis of uterine cancer, to review briefly the diagnosis of carcinoma of the uterus, to group correctly the various stages of the disease, and to base the indications for a correct treatment on such a grouping. Thus, we may form a common working ground to enable us to define the indications and limitations of surgical treatment as well as of radiation therapy. The proper method of the application of radiation will be briefly considered. The apparent value of the roentgen ray and gamma ray in cancer of the uterus will lastly be presented in a statistical report of 168 consecutive cases treated and followed from April 1, 1914, to Dec. 31, 1919.

The physician is frequently consulted by patients complaining either of a leukorrhea that has existed for many years, or persistent menorrhagias and metrorrhagias, or sterility, though they had given birth to an offspring within the average normal period of time after entering married life but suffer from constitutional diseases or disturbances of the endocrine glandular system. A small number of these patients may not present any visible or palpable pathologic conditions. The larger number, however, evince pathologic conditions, chiefly of either the cervix, the body of the uterus or of the vaginal outlet, such as diastasis of the levator ani muscles with prolapse of the vagina and

uterus, chronic cervicitis with hypertrophy, erosions, eversions and lacerations, chronic inflammations of the endocervix and endometrium and chronic myometritides. The pathologic states causing the enumerated symptoms are almost invariably characterized by hypertrophic processes—the result of proliferation of elementary tissue layers; hence treatment is rendered imperative. This may consist of a very thorough curettage of the endometrium and endocervix, an amputation or conical excision of the cervix, a levator ani muscle suture to close the vaginal introitus and thus prevent irritating substances from entering the canal. The removed tissues must be microscopically examined by a competent pathologist. As a matter of fact, the purpose of these surgical procedures is to obtain material to demonstrate absence or presence of malignancy. Should evidences of malignancy exist, then the classical panhysterectomy, either abdominal or vaginal, preferably with the use of the actual cautery, must follow the primarily diagnostic but also supposedly curative operative procedure. Quite a number of such patients may not show any evidences of malignancy on microscopic study of the removed tissue, yet after a brief period of an apparent recovery, the same symptoms and signs return. Such a state of affairs we should designate as clinically malignant and apply to it the treatment as advised for carcinoma.

Every gynecologist will recall a greater or less number of such instances. In my experience, almost all the patients that survived an operation for carcinoma for the customary five year limit had been either subjected to a panhysterectomy on account of unexpected microscopic findings or the recurrence and persistence of the underlying pathologic process after minor surgical procedures instituted for the correction of apparently benign diseases. Hence the treatment of cancer of the uterus comprises also prophylaxis.

SYMPTOMS

The cancer patient coming to the physician for consultation usually suffers from the well-known symptom triad: discharge, hemorrhage and pain—the discharge being the earliest, the hemorrhage the most alarming and the pain the most unfavorable symptom of cancer of the uterus. The occurrence of hemorrhage signifies an already advanced stage of the disease. The patient is willing to endure pain of quite a marked severity or to tolerate a discharge of even a marked odor, but the occurrence and persistence of hemorrhage will finally force her to seek medical advice.

The examination of a victim of uterine cancer should have for its purpose the exact answer to the following questions:

1. Is the cancer clearly localized within the uterus?
2. Has it invaded the contiguous tissues and organs?
3. Has it involved the regional lymph nodes?
4. Has it formed metastases in distant organs and structures, such as the liver and the bones?
5. Do constitutional diseases, such as Bright's disease, diabetes mellitus, decompensated heart lesions, complicate the uterine disease?

The methods to be applied are bimanual vagino-abdominal and recto-abdominal examinations, endoscopic examinations of the rectum and bladder, careful general physical and laboratory examinations. The results obtained will enable us to answer correctly the above mentioned five questions.

A clearly localized carcinoma indicates a surgical eradication. A panhysterectomy will enable the surgeon to remove absolutely all cancer cells. After having opened the abdomen, we must at once proceed to make a careful palpation and inspection of the pelvic organs. Should the regional lymph nodes be enlarged or the parametrial tissues be indurated, then the operation must be terminated, as it is unlikely that all the

cancer elements can be removed by even a very careful and extended operation. Therefore operability depends on one fact: absolute localization of the malignancy within the limits of the uterus. The deplorably poor results shown in the statistics of the surgical treatment of uterine cancers are solely due to the nonobservance of this one factor and tend to discredit surgery. As a consequence, a great number of patients refuse to submit to surgical treatment, even if indicated, being aware of the great number of failures following such a procedure.

Enlargement of the regional lymph nodes or induration of the parametrium may be the result of a secondary complicating infection. Since the greater number of carcinomas thus complicated are of an advanced stage, in which broken down and necrotic tissue form the port of entry for pathologic bacteria, it is evident that we must ascribe such findings in beginning cancer cases to malignant invasion.

Borderline cases, and those with a demonstrable beginning invasion of contiguous tissues and organs and regional lymph nodes, or clearly localized cases, occurring in patients with constitutional contraindications to operation, form the ideal group for radiation therapy. It is in these cases that roentgen ray and radium radiations caused the greatest number of local healings and apparent cures.

The advanced, desolate case, either with a "frozen pelvis," or extensive destruction of the vesicovaginal or rectovaginal septum, or marked cachexia, with general constitutional weakness, contraindicates radiation treatment. Such patients should be treated symptomatically. Should radiation be used, they may succumb to radiation toxemia, as they are so weakened by the cancer that they cannot any longer activate the defensive forces necessary to carry them safely over the period of reaction. Again the rays may rapidly destroy the necrotic processes, and urinary and fecal

fistulas may promptly appear, adding to the already unbearable misery the sufferings from such fistulas.

INDICATIONS FOR TREATMENT

Summarizing these facts, we may group the cases and formulate the indications for treatment thus:

Group I. Cases which are clearly localized after a physical examination—*the operable cases*—are treated with an abdominal panhysterectomy.

Group II. Cases which appear to be doubtfully localized after a physical examination—*the borderline cases*—and operable cases rendering a poor surgical risk owing to complicating constitutional diseases, form the ideal group for radiation therapy.

Group III. Cases in which a demonstrable invasion of the contiguous tissues and organs and regional lymph nodes is found on physical examination—*the clearly inoperable cases*—are subjected to an intensive radiation treatment.

Group IV. Cases so far advanced that all treatment seems hopeless—*the terminal, desolate cases*—are treated symptomatically.

Group V. Recurrent local or regional cases are treated according to the same grouping and indications as stated under Groups I to IV.

Various controversies have arisen from time to time concerning the advisability of combining surgical with radiologic procedures. Also there have been discussions concerning the choice of radiation—some assert that radium rays are more effectual in killing off the disease than roentgen rays; while others state that a combination of both radium and roentgen rays assures better results.

The object of the treatment of cancer of the uterus is the eradication or degeneration of all cancer cells without permanent injury of the neighboring healthy organs, such as the bladder, the rectum and the small bowels. The uterus is contained within the true bony

pelvis. The possible extent of the cancer in Groups I, II and III may be assumed to be confined to this space. The axis of the uterus corresponds in most cases to the axis of the true bony pelvis. The posterior bladder mucosa and the anterior rectal mucosa are from 2 to 3 cm. distant from the cervical canal. If radium is inserted into the cervical canal, the time duration of the application depends entirely on the intensity of radiation striking the bladder or rectal mucosa. For instance, 50 mg. of radium element filtered through 1.5 mm. of brass and 3 mm. of pararubber, inserted into the cervical canal, will cause an erythema of the vesical mucosa and of the rectal mucosa within thirty hours. Since the lethal amount of radiation that the rectal mucosa will bear without any permanent injury is 130, if 100 means the intensity of the dose sufficient to produce an erythema skin dose, we cannot extend the application of 50 mg. radium element beyond thirty consecutive hours, if we wish to avoid ulcers and strictures of the rectum, and so forth. It is, therefore, seen that the extent of the action of radium rays must be limited if we wish to avoid irreparable injury to neighboring vital pelvic organs. However, in doing this the cancer elements lying near the bony pelvic periphery are not only not degenerated but stimulated to increased activity and proliferation by the so-called "stimulating dose" of rays.

Institutions possessing large amounts of radium have recognized this fact and have attempted to treat the peripheral regions through the suprapubic abdominal wall, using packs containing upward to 1 gm. of radium element. Recently, it was reported that this plan has been abandoned, being economically inadvisable. If radiation therapy is ever going to be available to all the sufferers from uterine cancer, a technic must be evolved which can be used in every hamlet of our country. We have been working on this problem for many years and

we are convinced that by a combination of radium and roentgen radiations we may solve it. We possess an instrument which enables us to measure the intensity of radiation emitted from a Coolidge roentgen-ray tube. We found that with this instrument we could measure a quantity of irradiation, which applied through only two ports of entry under like conditions sends an intensity of about 75 per cent. of the surface skin intensity to the region of the cervix if the anteroposterior diameter of the pelvis is not more than 16 cm. (Fig. 1). Therefore,

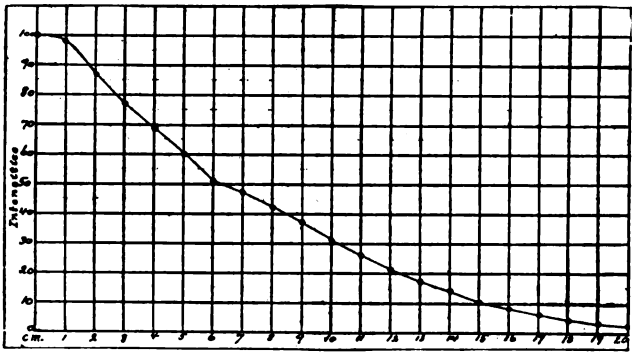

Fig. 1.—Measurements obtained with a Fürstenau intensimeter: transformer, Victor Snook; tube, Coolidge; 5 ma.; focal distance, 35 cm.; filters, 10 mm. aluminum and 6 mm. sole leather; K. V., 140 peak determined with a sphere gap; portal of entry, 20 cm. × 20 cm.

it is only necessary to supply the missing 25 per cent. with the use of radium radiation in order to obtain an intensity of 100 all through the pelvis. It being conceded that 100 represents the intensity of radiation necessary to produce an erythema skin dose, and it being further conceded that this intensity amply suffices to degenerate cancer cells. Fifty milligrams of radium element will accomplish this very nicely with a thirty hours' application. Patients with an anteroposterior diameter of more than 16 cm. from the anterior skin surface to the posterior skin surface require a longer continuous application, though we may cause severe injuries to the bladder and rectum with the larger doses (Tables 1 and 2).

TABLE 1.—ROENTGEN-RAY INTENSITIES OBTAINED FOR EACH CM. BY THE USE OF TWO PORTALS OF ENTRY—SUPRAPUBIC AND SACRAL: SIZE OF FIELD, 20 CM. DIAMETER; FOCAL DISTANCE, 32-35 CM.; MA. 5; MAX. K. V., 126; FILTER, 10 MM. ALUMINUM + 6 MM. SOLE LEATHER; FOR ANTEROPOSTERIOR DIAMETERS OF 16, 18, 20 AND 22 CM.*

I				II				III				IV			
	Intensities				Intensities				Intensities				Intensities		
Distance, Cm.	Anterior Field	Posterior Field	Total	Distance, Cm.	Anterior Field	Posterior Field	Total	Distance, Cm.	Anterior Field	Posterior Field	Total	Distance, Cm.	Anterior Field	Posterior Field	Total
Surface	100	8	108	Surface	100	4	104	Surface	100	2	102	Surface	100	0	100
1	98	10	108	1	98	6	104	1	98	3	101	1	98	1	**99**
2	87	14	101	2	87	8	95	2	87	4	91	2	87	2	**89**
3	77	17	94	3	77	10	87	3	77	6	**83**	3	77	3	**80**
4	69	21	**90**	4	69	14	**83**	4	69	8	77	4	69	4	73
5	60	26	**86**	5	60	17	77	5	60	10	70	5	60	6	**66**
6	51	31	**82**	6	51	21	72	6	51	14	**66**	6	51	8	**59**
7	47	37	**84**	7	47	26	73	7	47	17	**64**	7	47	10	57
8	42	42	**84**	8	42	31	73	8	42	21	**63**	8	42	14	56
9	37	47	**84**	9	37	37	74	9	37	26	**63**	9	37	17	**54**
10	31	51†	**82**	10	31	42	73	10	31	31	**62**	10	31	21	**52**
11	26	60	**86**	11	26†	47	73	11	26	37	**63**	11	26	26	**52**
12	21	69	**90**	12	21	51	72	12	21†	42	**63**	12	21	31	**52**
13	17	77	94	13	17	60	77	13	17	47	**64**	13	17	37	**54**
14	14	87	101	14	14	69	**83**	14	14	57	**66**	14	14†	42	**56**
15	10	98	108	15	10	77	87	15	10	60	70	15	10	47	57
16	8	100	108	16	8	87	95	16	8	69	77	16	8	51	**59**
				17	6	98	104	17	6	77	**83**	17	6	60	**66**
				18	4	100	104	18	4	87	91	18	4	69	73
								19	3	98	101	19	3	77	**80**
								20	2	100	102	20	2	87	**89**
												21	1	98	**99**
												22	0	100	100

* Intensities in boldface figures require additional radiation supplied by a 50 mg. radium element capsule thus: to I add 20 hours; to II add 30 hours; to III add 40 hours, and to IV add 50 hours.

† Indicates the usual location of cervix.

TECHNIC

The technic of radiation treatment, therefore, consists in the combined use of roentgen and radium radiation. A solution of the problem is shown in Figure 2. It shows the intensity of measured rays at each point within the pelvis for roentgen rays, also the isodoses of gamma rays measured with a 50 mg. radium element capsule within water, thus indicating the total primary and secondary radiations. The measured roentgen ray

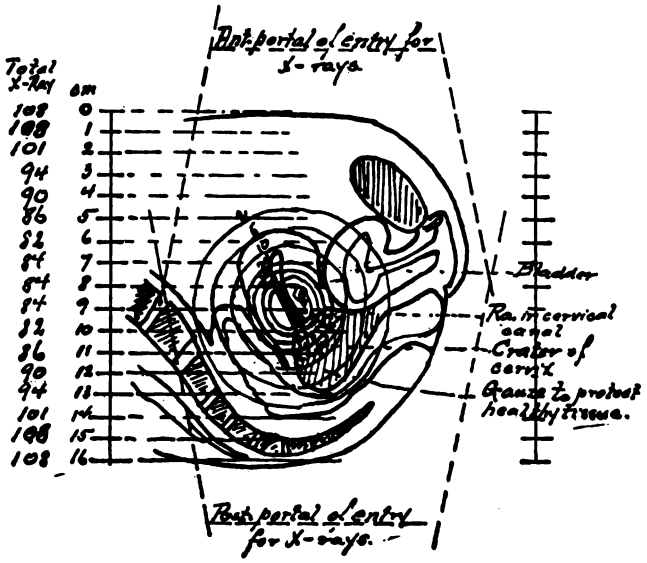

Fig. 2.—Median longitudinal section of pelvis, showing isodoses of radium capsule: column at the left gives total roentgen-ray intensities obtained for each centimeter of depth.

intensities also represent a summation of primary and secondary radiations. Table 1 indicates how unfavorably the summation of radiation becomes with an increase in the anteroposterior diameter above 18 cm. The greater diameters are found in obese and large boned women. To increase the radiation dose in such patients, we have of late applied roentgen rays through three portals of entry. The advantages thus gained are

an increased roentgen ray intensity in the cancer area as demonstrated in Figure 3.

Should radiation treatment be combined with surgical procedure to increase the efficiency of either one? It has been proposed to precede panhysterectomies for cancer of the uterus with radiation therapy, obviously to degenerate the cancer first and thereby render safer the surgical procedure. To apply radiation properly, it is necessary to employ such an intensity of radiation that the periphery of the bony pelvis is struck with the

TABLE 2.—INTENSITIES OF GAMMA RADIATIONS OF 50 MG. RADIUM ELEMENT CAPSULE: LENGTH, 3 CM.; FILTERS, 1.5 MM. BRASS, 5 MM. CELLULOID

Surface Roentgen-Ray Dose of 100 Equals E. S. D. Equals 425 Mg. Radium Element Hours (Friedrich)

Distance in Cm.	Percentage of Isodoses	Roentgen Ray Dose	Values in Mg. Ra. El. Hrs.	
			Values	Round Numbers
1.5	40	100	425.0	400
2.3	20		212.5	200
3.4	10		106.3	100
4.7	5		53.2	50
5.6	2		21.3	21

Values of Gamma Radiation Expressed in Values of Roentgen Ray Dose for Various Distances and Time durations of Applications

Distance, Cm.	10 Hrs.	20 Hrs.	30 Hrs.	40 Hrs.	50 Hrs.	60 Hrs.	70 Hrs.	80 Hrs.
1.5	125.0	250.0	375.0	500.0	625.0	750.0	875.0	1,000
2.3	62.5	125.0	187.5	250.0	312.5	375.0	437.5	500
3.4	31.3	62.5	93.8	125.0	156.5	187.5	218.8	250
4.7	15.7	31.3	47.0	62.5	78.5	94.0	109.7	125
5.6	6.3	12.5	18.9	25.0	31.5	37.8	43.8	50

same intensity as the region in the axis of the pelvis, that is, the cervix. Otherwise, the peripheral cancer cells are stimulated to increased proliferation. Such a radiation treatment always causes a decided radiation sickness. During this period the patient could not be safely subjected to the additional trauma and shock of a capital surgical procedure. The operation must be postponed for from three to six weeks, during which time the patient will have recovered from the radiation toxemia. If the operation is performed within a few days after radiation, the patient with an alarming frequency succumbs to

sepsis and shock. Should the operation be postponed to a later period, the same danger is still present on account of necrosis of tissue in the cervical canal which cannot be avoided. These factors and the intense connective tissue formation in the parametrium, which renders hemostasis difficult, therefore do not let it appear advisable to resort to preoperative radiations.

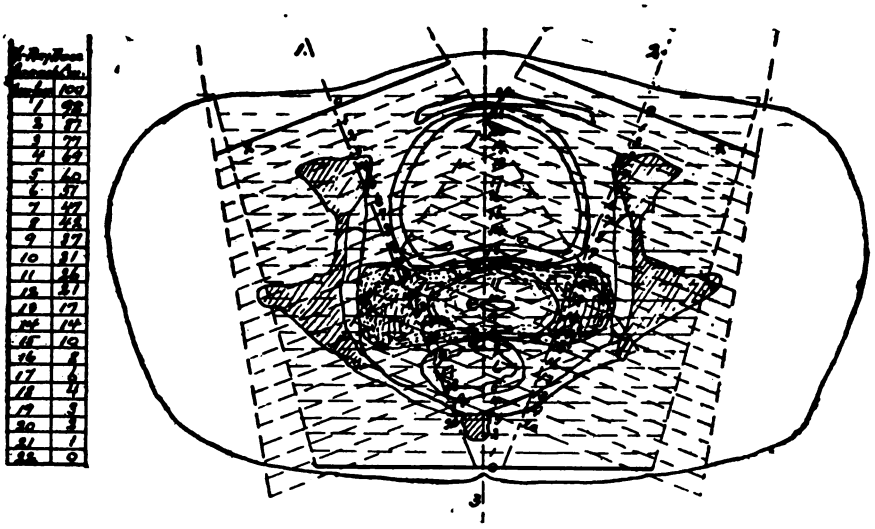

Fig. 3.—Patient with anteroposterior diameternous processes, marked ×, 28.5 cm. Radiation transverse diameter, 44.5 cm.; anterosuperior spiout 55 degrees, so that axis is centered on cervix. beams 1 and 2 should be applied at an angle of ab of 25 cm. reduced by compression to 22 cm.;

Dose at *a*: 21 + 21 + 21 = 63.
Dose at *b*: 42 + 8 + 8 = 58.
Dose at *c*: 31 + 26 + 8 = 65.
Dose at *d*: 31 + 8 + 26 = 65.
Dose at *e*: 31 + 14 + 14 = 59.

Dose at 18: 4 + 41° + 41° = 86.
Dose at 19: 3 + 48° + 48° = 96.
Dose at 20: 2 + 55° + 55° = 112.
Dose at 21: 1 + 55° + 55° = 111.

Dose if only one anterior median and one posterior median field is used:

At *a*: 21 + 31 = 52.
At *b*: 42 + 14 = 56.
At *c*: 31 + 21 = 52.
At *d*: 31 + 21 = 52.
At *e*: 31 + 21 = 52.

* Peripheral intensities are 20 per cent. less than those within a radius of 6 cm. Technic: Coolidge tube; 140 peak kilovolts; 5 ma.; 35 cm. focal distance; 10 mm. aluminum + 6 mm. sole leather filters.

RECURRENCES

Should a panhysterectomy for a clearly operable uterine carcinoma be followed by radiation to prevent recurrences? Recurrences result from carcinoma cells left behind during an operation. They are found either

in the tissues surrounding the wound crater or at the periphery of the bony pelvis. The former are termed local and the latter regional recurrences. The very element rendering radium treatment of the cervical region possible without causing irreparable damage to the bladder and rectum, i. e., the uterus, has been removed by the operation. Radium rays could now be made effective only in the superficial tissues of the wound cavity and the vaginal fornix. Additional roentgen-ray radiation applied also will not enable us in conjunction with radium radiation to attain the uniform intensity all through the pelvis necessary for our purpose. Hence, I am more and more inclined to the opinion that the cancer must be clearly confined within the limits of the uterus, if operation is justifiable. Under these conditions, postoperative radiations are useless. If, however, an operation has been performed, and during its progress, it is found that the cancer has invaded adjacent structures, or the probabilities are that cancer tissue has been left behind, then a combined radiation treatment must be given. It must be as intensive as if the panhysterectomy had never been performed, regardless of the consequences to the patient. If we wish to be successful, we must treat the disease and not the patient.

It has been advocated to render inoperable carcinomas operable by radiation, as the latter causes an apparent resorption of the cancer tissue. The uterus and adnexa will appear freely movable and of normal size, shape, form and consistency. A panhysterectomy could be easily performed, though necrosis might still be present in the cervical canal and hemostasis be difficult of execution. Again it has been proposed to excochleate and cauterize the tumor bed. Radiation would then become more effective. However, my experience leads me to state that preradiation curettage and cauterization or postradiation panhysterectomy in the clearly inoperable cases render the patient's chances for even a tem-

porary improvement in health decidedly worse. As a matter of fact, the rule is that patients of the borderline and inoperable groups, treated with a combination of radiation and surgery, quickly succumb either to sepsis or to a recurrence, in spite of the most carefully executed radiation treatment.

An active immunization is produced by the action of radium on malignant cells. If radium or roentgen rays would simply kill the cells, then they would not be superior to the knife or any cauterizing agent. But the cancer cells under the influence of rays are stimulated to produce a specific antibody for other similar cancer cells in the tissues of the patient being treated. Morson, Wedd and Russ, Blumenthal and Behne have proved this contention in experiments carried on in animals as well as man. Hence, if living malignant cells are necessary for the production of an autogenous vaccine or antibody, a preradiation removal of cancer cells would not be advisable. The ray therapeutist also must prevent a too extensive destruction of normal and malignant tissues, and an insufficient modification or degeneration of malignant cells. If the treatment is too radical, antibodies necessary for the complete removal of all cancer cells are not produced. If too small, the action may arrest the growth for the time, but recurrences must be expected.

RESULTS OF TREATMENT

From April, 1914, to Dec. 31, 1919, 168 patients with cancer of the uterus were treated with radiation. In some cases treatment was preceded by surgical procedures, such as hysterectomy or cauterization, and in others, radiation was followed by hysterectomy. However, since 1918, radiations were used exclusively. We also must state that the technic of application of rays underwent a continuous evolution until the last two years when a technic had been evolved which has been described in this paper. I believe that with the development of larger Coolidge tubes which will stand higher

TABLE 8.—END-RESULTS OF UTERINE CANCER TREATED WITH RADIUM

Year	Operable			Borderline			Inoperable			Terminal			Recurrent		
	Total No.	Living	Died or No Report	Total No.	Living	Died or No Report	Total No.	Living	Died or No Report	Total No.	Living	Died or No Report	Total No.	Living	Died or No Report
1914	2	1	1	2	1	1	12	..	12	1	..	1	4	..	4
1915	..	..	..	2	1	1	9	..	9	6	..	6	9	..	9
1916	1	1	..	1	..	1	8	..	8	6	..	6	7	..	7
1917	..	..	..	1	1	..	8	4	4	4	..	4	3	..	3
1918	2	1	1	3	2	1	9	6	3	8	..	8	8	..	8
1919	2	2	..	2	1	1	22	9	13	11	1	10	15	1	14
Total	7	5	2	11	6	5	68	19	49	36	1	35	46	1	45

Percentages of Apparent Cures for 2, 3 and 5 Year Periods

1914 to 1919 incl.	Operable.... 7	Borderline..11	Inoperable..68	Terminal.....36	Recurrent....46
	Living..... 5 = 71.4%	Living..... 6 = 54.5%	Living.....19 = 27.9%	Living..... 1 = 2.5%	Living..... 1 = 2.2%
1914 to 1918 incl.	Operable.... 5	Borderline.. 9	Inoperable..46	Terminal.....25	Recurrent....31
	Living..... 3 = 60.0%	Living..... 5 = 55.6%	Living.....10 = 21.7%	Living..... 0 = 0.0%	Living..... 0 = 0.0%
1914 to 1916 incl.	Operable.... 3	Borderline.. 5	Inoperable..29	Terminal.....13	Recurrent....20
	Living..... 2 = 66.6%	Living..... 2 = 40.0%	Living..... 0 = 0.0%	Living..... 0 = 0.0%	Living..... 0 = 0.0%

voltages and of transformers which will furnish voltages up to 200,000, we will overcome the difficulties that exist in patients having a greater anteroposterior diameter than 18 cm.

Table 3 shows the number of patients treated each year, also the numbers surviving today and the number of those that have died or did not report. From the table it is seen that in Group 1 of a total of seven patients treated, five are living and well (71.4 per cent.). In Group II, of eleven patients, six are alive and well (54.5 per cent.). In Group III, of sixty-eight patients, nineteen are alive and well (27.9 per cent.). In Group IV, of thirty-six pateints, one is alive (2.5 per cent.). And in Group V, of forty-six patients, one is alive (2.2 per cent.).

Surgery alone probably would have produced the same good results shown in Group I. We must, however, credit ray therapy for all permanent and even temporary benefits in the other groups. That implies that of 161 patients in these groups, twenty-seven are well today that otherwise would probably have succumbed to the disease (16.8 per cent.). The total percentage of apparent cures in 168 cases is 19 +. It also implies that the earlier a patient with carcinoma of the uterus is treated with radiations, the better will be the prognosis for an apparent or ultimate cure.

CONCLUSIONS

The conclusions drawn from this study are:

1. Prophylaxis plays an important factor in the treatment of cancer.

2. Classification of uterine carcinomas is of paramount importance to separate localized from the more advanced cases.

3. Localized carcinomas must be treated by surgical methods, preferably with the use of the actual cautery, while the borderline and advanced cases should be referred to ray therapy.

4. A combination of surgery with radiotherapy is not advisable. However, a combination treatment of gamma and roentgen rays assures better results than the application of either agent alone. The radium must be inserted into the cervical canal, while the roentgen rays are applied through the suprapubic and sacral regions. This also renders the treatment available for all classes of patients, owing to the lessened expense.

5. It is hoped that with an improvement in the technic, permanent recoveries will become more numerous.

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IRRADIATION IN CANCER OF THE FEMALE GENITO-URINARY ORGANS

RESULTS IN THREE HUNDRED AND THIRTEEN CASES

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AND

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From time to time during the last five years we have recorded in the current medical periodicals our results from the treatment of cancer of the pelvic organs with radium, particularly of the uterus, and in these articles we have dwelt especially on the palliative effect of irradiation rather than to hazard a discussion as to the possibilities of ultimate cures, notwithstanding the justifiable hopes as to this outcome. We have maintained this position because of the skepticism which the world holds as to the settlement of this age-long quest for a dependable remedy for cancer. Today we may assert with positive assurance that even in the inoperable case of cancer of the cervix a surprising number, as reckoned by the quinquennial test, have survived and are quite free from any demonstrable or symptomatic evidence of cancer. Those patients that are alive and well were registered in our clinic in the first years of our use of radium, while methods were largely in the proving ground, for we then knew little of the dangers and range of action of this occult force. In view of the fact that these cruder attempts have yielded a definite percentage of cures, we feel greatly encouraged; for with improvements in application and with a consequent

lessening of bad sequelae, a decidedly better outcome may be forecast as these later series come up for review. In order that there should be no conflict in our report between the more recent and the older cases, we have included only those treated before August, 1920, thus leaving out of count the clinical product of the past year. Our report deals with a total of 313 cases; 112 of the patients are living and 201 dead.

TABLE 1.—DIAGNOSIS

	Patients Living	Patients Dead
Carcinoma of cervix	66	148
Carcinoma of fundus	12	11
Chorio-epithelioma	2	..
Carcinoma of cervical stump	4	..
Recurrent carcinoma of vagina after hysterectomy	7	14
Epithelioma of vagina	4	13
Carcinoma of urethra	2	4
Carcinoma of bladder	1	2
Operation and radium	10	4
Miscellaneous	4	5
Total	112	201

METHOD OF TREATMENT

All of our patients have been subjected uniformly to 100 mg. of radium for twenty-four hours at the first application, and this dosage may therefore be considered as the standard to which we have adhered, with only an occasional exception in more than 400 cases treated up to date. We have purposely held to this standard because the primary results in our first 100 cases appeared to be so satisfactory in promoting relief of the chief symptoms of cancer that it seemed injudicious to change it radically. As several workers in irradiation have used different dosages, both as to quantity, duration of application, and repetitions of treatments, and since we are all in accord as to the primary palliative results, it seemed best for us to pursue in our clinic this course so that when we all assemble our reports in critical review, we may judge as to the best way of synchronizing methods and

arriving at a uniform plan of action among those clinics in which the larger and smaller quantities are respectively available.

Our plan through at least 150 cases was to apply 100 mg., contained within a glass capsule and this in a platinum tube, and this in turn enclosed in black rubber tubing, for twenty-four hours in immediate contact with the cervix, the healthy adjacent tissues being shielded from undue injury with lead protectors. After a six weeks' interval, this procedure was repeated. As to the results, we found that several patients sustained burns of sufficient intensity to cause much irritability of the bladder, or an acute proctitis occasionally causing pain varying from a mild and fleeting character to that of severe and persistent intensity. While this was by no means a uniform sequel, it occurred with sufficient frequency to be a decided disadvantage and a trying and discouraging ordeal for the patient. Added to this immediate effect came the later and much graver complication, an occasional vesical or rectal fistula, and these are always obstinate or even intractable to healing either by operation or through the expectant policy.

Among our living patients, 112 cases, thirteen have had fistulas; of the 201 dead, twenty-one were noted sooner or later before death. As to the living patients, we attribute practically all to the effects of irradiation, but this acknowledgment does not constitute a condemnation but a warning, to which we shall refer later. Among the 201 dead patients, we consider only twenty-one fistulas, approximately 10 per cent., as a definite triumph for irradiation; for among those who ultimately succumbed there were sixty in whom the local healing was maintained to the end, the patients dying of metastases. The assertion that had the same number of inoperable cases reached the end without irradiation, fistulas in a considerably larger percentage should have been a natural incident of the cancerous invasion of the bladder or rectum, does not appear as question-

able but rather the statement of a fact. Our position, therefore, is that while radium actually does produce fistulas in a small percentage of patients, on the whole it actually defends a much larger ratio against this complication.

To remain contented with this adjustment of equations is, however, not our desire, and to obviate this very disabling accident, we have completely discarded

TABLE 2.—CARCINOMA OF CERVIX

	Patients Living	Patients Dead
Hemorrhage:		
Complete relief	51	84
Temporary relief	4	13
Not stated	2	49
Not traced	9	2
No effect	..	..
Total	66	148
Leukorrhea:		
Complete relief	37	46
Temporary relief	3	..
No effect	5	19
Increased	..	2
Not stated	12	81
Not traced	9	..
Total	66	148
Pain:		
Relieved	21	40
Unrelieved	3	30
Pain caused by radium	3	..
Pain not present	30	..
Not traced	9	..
Not stated	..	78
Total	66	148
Bladder irritability after irradiation	4	8
Rectal irritability after irradiation	2	7
Both	..	1
Fistulas:		
Vesicovaginal	2	5
Rectovaginal	1	7
Both	3	7
Local healing	42	51

Alive:		Died:	
1 year	7	Under 6 months	44
1 to 1½ years	9	6 months to 1 year	42
1½ to 2 years	4	1 to 1½ years	21
2 to 2½ years	9	1½ to 2 years	10
3 to 4 years	10	2 to 2½ years	11
4 to 5 years	6	2½ to 3 years	5
5 to 6 years	7	3 to 4 years	3
6 to 7 years	2	4 to 5 years	3
Traced less than one year	3	5 to 6 years	1
Not traced	9	Not stated	8
Total	66	Total	148

all metal protectors in vaginal applications, and instead use gauze packing (Fig. 1). For this suggestion, we are indebted to Dr. Burnam. By far the larger number of fistulas date back to the period of lead protectors; but with our present plan we have much less apprehension as to this possible complication. Thus we mark as a first departure from our original standard of application the casting into the discard of metal protectors. A second, and we believe a very important conviction, we have arrived at through our experience. Here, as in all other successful therapeutic methods, the rule of thumb is hazardous. By no acuteness of perception on our part, but through the apparent stupidity of a few patients who, regardless of grave warnings as to the dangers of procrastination, delayed reporting for a second treatment, we have discovered that in a considerable proportion of cases the lethal blow to cancer of the cervix is given by the first impact of the radium, and the question has arisen, Do repeated applications make assurance doubly sure, or may they not occasionally jeopardize a successful issue?

We are not fully prepared to answer this query, but we are convinced that the routine repetition of treatments is injudicious without taking into full account the results of the first treatment. For instance, in one class of cases, in which the patients reported six weeks after the initial application, we find remarkable local healing in process of completion; in another the ulceration appears to be in statu quo, while in a third no apparent beneficial effect is evident; on the contrary, a definite failure to hold in check the ulceration is obvious. In the occasional case, we believe that there is an actual acceleration of the growth. Thus, of the 201 dead patients, fifty-nine had reached the end within six months after the application of radium, a frequent experience after radical operations.

To utilize this observation as a proof of actual acceleration of the malignant growth depends, not on the failure of radium to destroy at least a portion of the

cancer, for this it invariably does, but on the fact that the growth is so widespread that cancer cells outside the zone of effective action may actually be stimulated to a more rapid proliferation and thus quickly obscure any possible beneficial effect at the point of intensive contact. We are, therefore under the impression that

TABLE 3.—CARCINOMA OF FUNDUS

	Patients Living	Patients Dead
Hemorrhage:		
Complete relief	7	5
No effect	1	..
Temporary relief	1	..
Not stated	2	..
Not traced	1	..
Total	12	5
Leukorrhea:		
Complete relief	5	..
No effect	1	..
Not stated	5	..
Not traced	1	..
Total	12	3
Pain:		
Relieved	2	..
Unrelieved	..	1
Not stated	9	..
Not traced	1	..
Total	12	1

Alive:		Died:	
1 year	2	Under 6 months	1
1 to 1½ years	3	6 months to 1 year	5
2 to 2½ years	1	1½ to 2 years	1
2½ to 3 years	1	2 to 2½ years	1
3 to 4 years	1	No date	3
4 to 5 years	1		
5 to 6 years	1	Total	11
Not traced	1		
1½ to 2 years	1		
Total	12		

a certain number of patients receive no beneficial effect from irradiation, and hence we are inclined to limit its employment to those cases in which there is a visible or palpable localization of the gross changes.

When there is a deep crater occupying the site of the lower uterine segment and extending out to the pelvic walls and backward and forward to the vesical and rectal walls, with grave cachexia and other evidence of metastasis, we may by this treatment actually render

more wretched the few remaining weeks of existence of these patients. Also, when there are fixed pelvic masses extending out to the iliac walls, very seldom can anything be accomplished, for the destructive changes are too far removed from the focus of irradiation for even palliative measures. As we are not employing the emanations, we cannot speak as to results in these cases when the glass tubes are embedded in the malignant mass.

In those cases in which a progressive favorable action is noted six weeks after the initial treatment, not infrequently the patient is advised to return again in six weeks, and if then we find a white hyaline cicatrix fully covering the site of the ulcer we further delay action and may not see the patient again for six months.

In the second class of cases in which no progress is noted, we usually make one more application and await the turn of events at the end of another six weeks' interval. At that time should no progress be noted, further irradiation is abandoned, for we class such cases as hopeless.

Within our knowledge, no favorable turn has been noted from a third application if the first two are unsuccessful. To repeat the treatments only adds to the patient's distress. Here, as is observed with any operation in the hopeless case, the remedy may be severely condemned, thus generating a prejudice among the friends or family of the patient which may subsequently block its use in some other favorable case.

Another modification in our method of application deserves especial mention. In the first three years of our experience, we were content to make the application without the aid of an anesthetic. A bit of tissue was snipped off or gently curetted away for confirmative diagnostic purposes, and the radium was then applied, usually with the patient in the knee-breast or Sims posture. Under these conditions, it was frequently difficult to adjust the radium tube accurately

to the affected area. In applying the metallic vaginal shields, or as in later cases, the gauze pack, the tube might shift and thus cause trouble. To obviate these dangers and to be certain of a complete orientation at the first sitting, nitrous oxid anesthesia is administered. If there is a large cauliflower mass it is excised

TABLE 4.—CHORIO EPITHELIOMA (Patients Living)

Hemorrhage (complete cessation)	2
Local healing	2
Alive 6 to 7 years	2

by the cautery. By this procedure, radium may be brought at least one or more inches nearer the crucial area, thus securing a full contact and avoiding the rapidly lessening effect of the intensive irradiation as the distance is increased (Fig. 2).

Further, when possible we always insert a 50 mg. tube within the cervix and a cross contact tube of equal quantity in the cervical crater or vaginal vault. Not infrequently a superficial conelike incision is made with the cautery, avoiding a deep penetration into

TABLE 5.—CARCINOMA OF CERVICAL STUMP (Patients Living)

Hemorrhage (complete cessation)	2
Not stated	2
Leukorrhea:	
Complete relief	2
Not stated	2
Total	4
Bladder irritability after irradiation	2
Local healing	2
Alive:	
1½ to 2 years	2
3 to 4 years	2
Total	4

healthy tissues, and the radium tubes are enclosed within this cup with fine catgut sutures (Fig. 3). At a six weeks' interval a second contact application of 100 mg. is made in the vaginal vault. As to the use of radium needles, our experience is as yet too limited

to warrant any positive assertion as to their value in cervical cases, but we anticipate a betterment of statistics from this source of deeper irradiation. Since cancer extends by the broad and uterosacral ligaments, we not infrequently insert four needles of about 13 mg. each into these structures (Figs. 4 and 5). Obviously, the danger of injuring the rectum or perforating Douglas' culdesac attends the penetration of the uterosacral ligaments, while the ureters or uterine vessels are jeopardized in the broad ligaments. Through the guidance of the needle with one finger in the rectum, and directing the needle slightly posteriorly and outward in the broad ligaments, these dangers may largely be obviated. At least, thus far we have had no unhappy encounters of this nature.

TECHNIC OF APPLICATION

Patients are prepared as usual for gas anesthesia, a hypodermic of morphin, one-fourth grain, and atropin sulphate, $\frac{1}{150}$ preceding the operation by one-half hour. The patient is prepared as for a plastic operation on the cervix, care being observed not to traumatize unduly the carcinomatous area in the cleansing process. Then a complete examination by vagina and rectum is made in order to determine the extent and character of the growth. If there is a cauliflower mass, it is removed with the cautery and not the curet. Too much stress cannot be laid on the dangers of harsh manipulative use of the curet, or excision of tissue with the scalpel in the advanced cases. When there is a crater, we never use the curet or even the cautery. When the case is of the cauliflower type, the superficial mass is removed only down to the cancer base in order to reduce the distance to the frontier zone of infiltration. The cervical canal is dilated if it is discoverable, and the first tube of 50 mg. of radium salt in black rubber tubing is inserted into the uterus. On the vaginal portion of the cervix or within the crater a similar tube is

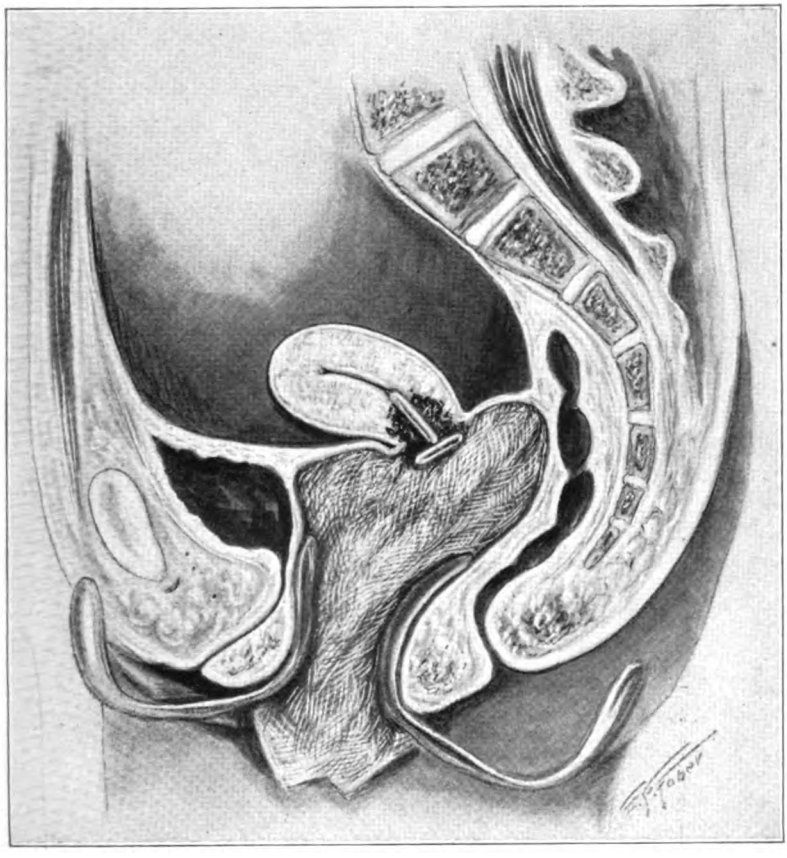

Fig. 1.—Voluminous gauze packing placed with the aid of Sims specula in such a way as to press the rectovaginal wall backward and the vesicovaginal wall forward out of the way of harmful contact.

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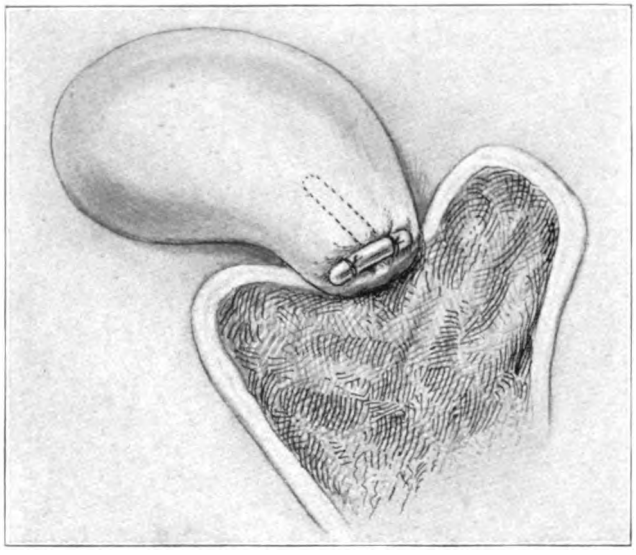

Fig. 2.—In the usual case without cauliflower excresence, one tube is inserted within the canal and a second held in crosswise contact held with a fine catgut suture.

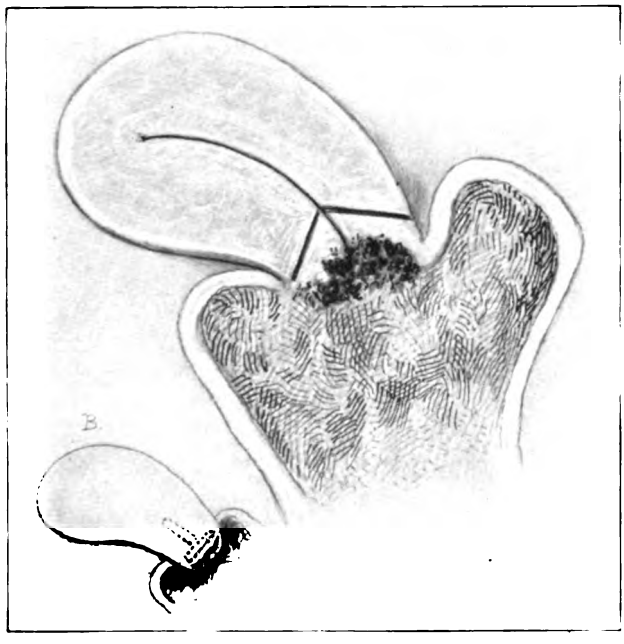

Fig. 3.—Area of excision with the cautery knife marked with triangular converging lines. After this cervical cone is removed, one 50 mg. tube is inserted in the cervix and a second is placed crosswise within the crater. The two flaps may then be closed with fine catgut sutures, thus holding the tubes in a secure place where their maximum force may safely be expended.

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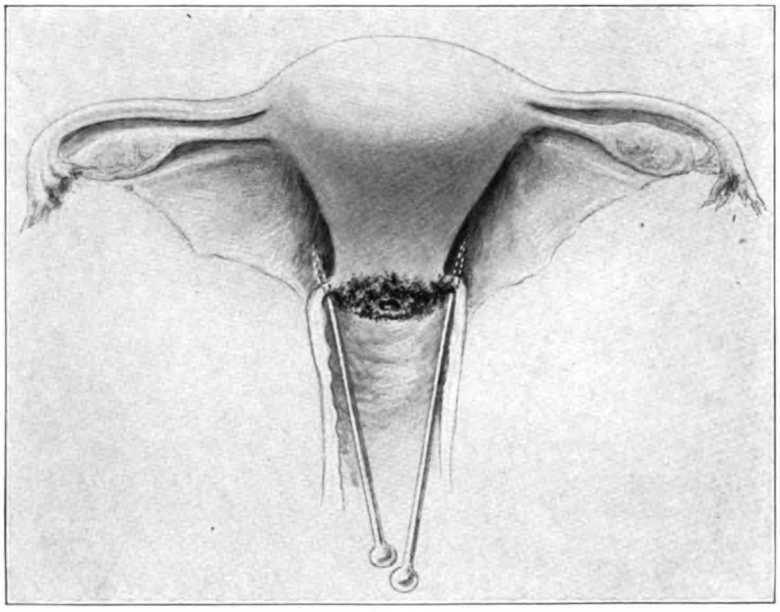

Fig. 4.—Radium needles iserted about 1 inch into the parametrium. In introducing these needles a point is selected lateral to the cervix and slightly posterior to a mid-transverse line of the cervix. By observing this precaution the ureters and uterine blood vessels are in less hazard.

Fig. 5.—Lateral view of needles inserted in the sacral and broad ligaments.

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held by fine catgut sutures. If it is desirable to employ the needles, they are inserted into the appropriate areas, as described above, not more than 1 inch in the broad ligaments and approximately 1½ inches in the uterosacral ligaments. It is necessary to make this maneuver more or less blindly, the sense of touch being our only

TABLE 6.—RECURRENT CARCINOMA OF VAGINA AFTER HYSTERECTOMY

	Patients Living	Patients Dead
Hemorrhage:		
Complete cessation	7	7
No effect	..	2
Not stated	..	5
Total	7	14
Leukorrhea:		
Complete relief	5	3
No effect	1	6
Not stated	1	5
Total	7	14
Bladder irritability after irradiation	1	..
Rectal irritability after irradiation	1	..
Pain:		
Relieved	..	2
Unrelieved	..	6
Not stated	..	6
Total	..	14
Fistulas:		
Vesicovaginal	1	1
Rectovaginal	1	2
Local healing	3	3

Alive:		Died:	
1 year	1	Under 6 months	8
1½ years to 2 years	1	6 months to 1 year	3
2 to 2½ years	1	1 to 1½ years	3
2½ to 3 years	2		
3 to 4 years	1	Total	14
4 to 5 years	1		
Total	7		

guide. The Lee type of needle is used, screwed to a staff of about 3 inches in length. The posterior vaginal wall is retracted well back from the cancerous area with a long Sims speculum, likewise the anterior vaginal wall toward the symphysis. Thus the posterior vaginal wall and rectum may be pushed 1 inch or more back toward the hollow of the sacrum, and the vesical wall is removed almost as far from harmful effects. This we

consider a capital method for preventing an irradiation proctitis or cystitis, with the attendant hazards of fistulas.

In cancer of the fundus, we always incline even in advanced cases to operation. In this connection, we simply reiterate what has been said in previous articles: "In cancer of the cervix, when in doubt always irradiate; in cancer of the fundus, when in doubt operate." However, in cancer of the fundus, when there are grave contraindications to surgical intervention, we turn to radium with great hope when the case is within reasonable limits. In our list of 313 cases, there have been only twenty-three cases of cancer of the fundus. Of these, twelve patients survive from three to six years without objective symptoms or demonstrable lesions. The remainder are below a three-year limitation but are in excellent health. In eleven cases which were far advanced when treatment was given, the patients are dead, but there were none of these within the potentialities of the most daring surgeon.

How does healing take place in cases of cancer treated by radium? As we see the factors in this process, we summarize them as follows: First, local destruction, then a considerable fibrous tissue formation with an ultimate condensation cicatrix followed by more or less hyalization. To the latter processes, we attribute the chief possibilities of a cure. To thrive, cancer requires vascularization on its frontier zone. A hyaline or fibrous barrier is, therefore, an effective block against the invasion of new blood vessels and serves excellently in the process of incarceration or segregation of malignant cells.

In McCarty's discussion before the last meeting of the Southern Surgical Society, he laid special emphasis on the beneficence of the latter processes in the retardation or starving out of cancerous growths. To this theory we offer hearty support. A very telling instance to sustain this point is found in one of our cases of

carcinoma of the vagina in which there was almost a complete atresia at the time of the first treatment, and yet the patient is alive and well after nearly five years. When first seen we considered the case hopeless. One hundred milligrams of radium divided between two tubes were inserted tandem fashion into the narrow vagina and were left in place twenty-four hours. One

TABLE 7.—EPITHELIOMA OF VAGINA

	Patients Living	Patients Dead
Hemorrhage:		
Complete relief	4	4
No effect	..	1
Temporary relief	..	3
Not stated	..	4
Total	4	12
Leukorrhea:		
Complete relief	3	2
No effect	..	3
Increased	1	1
Not stated	..	7
Total	4	13
Pain:		
Relieved	1	..
Unrelieved	..	2
Not stated	3	11
Total	4	13
Rectal irritability after radium	..	1
Fistulas:		
Rectovaginal	..	3
Local healing	..	4
Total	..	7

Alive:		Died:	
1 to 1½ years	1	Under 6 months	5
1½ to 2 years	1	6 months to 1 year	3
3 to 4 years	1	1 to 1½ years	3
4 to 5 years	1	1½ to 2 years	1
		2½ to 3 years	1
Total	4	Total	13

year later, on the patient's return, there was a complete cicatricial occlusion of the vagina. At the introitus there was a slight carcinomatous ulcer surrounded by a hyaline fibrous circle. We were so fearful of breaking down this area by further irradiation, with resultant rectal and vesical fistulas, that we removed a small bit of tissue for confirmative diagnosis and advised against any further treatment. One year later all traces of the

cancer had disappeared, and the patient is now nearing the completion of her five-year period quite free from any trace of cancer.

This is but one instance of many which sustain our argument against operation after successful irradiation in a previously inoperable case. Logically, a surgeon cannot remove tissue outside the operable area, and to break down these barriers and open up fresh tissue with the possible release of imprisoned cells may actually lead to the worst results. We have found no evidence whatever to incline us toward surgical intervention after successful irradiation, but quite positively in the contrary direction. Finally, what is, our attitude concerning immediate anteoperative irradiation? From dire experience we have definitely discarded this plan, and while this decision is based on a very limited experience, it was, nevertheless, an alarming one.

The bad results occurred in two cases of high amputation of the cervix a day or two subsequent to a twenty-four hour irradiation. For a few days, a splendid convalescence followed; then an ugly infection with widespread disintegration developed in the operative area. One patient died of a slow but progressive pyemia; the other passed through a stormy convalescence, but finally recovered. To devitalize tissues invaded with septic bacteria, which are not destroyed before surgical intervention, makes indeed a bad outlook for the surgeon. Possibly a very evanescent irradiation of from four to six hours in order to blight only the superficial areas and not the deep tissues might be effective in reducing implantation possibilities. Beyond this, however, we enter a zone of deepening shadow. In the event of a hysterectomy being performed, we prefer to irradiate from fourteen to twenty-one days later, after the surgical cicatrix in the vagina is fixed, and then under careful protection and only for twelve hours.

As will appear in our statistical tables, the percentage of patients suffering from inoperable carcinoma of the cervix and yet living without evidence of cancer from three to four years on to six and seven years is 24 per cent. Without doubt, no other method of treatment attended with so little danger can show such excellent results. In all of our series of cases, now more than 400, only two deaths occurred shortly after irradiation

TABLE 8.—CARCINOMA OF URETHRA

	Patients Living	Patients Dead
Hemorrhage:		
Complete relief	2	3
No effect	..	1
Total	2	4
Leukorrhea:		
Complete relief	..	2
Increased	2	..
Not stated	..	2
Total	2	4
Pain:		
Unrelieved	..	2
Not stated	..	2
Total	..	4
Fistulas:		
Rectovaginal	1	..
Vesicovaginal	..	1
Vesicorectovaginal	..	1
Total	1	2

Alive:		Died:	
1 to 1½ years	1	6 months to 1 year	1
5 to 6 years	1	1 year to 1½ years	3
Total	2	Total	4

Local healing 2

alone. A few years ago one of us reviewed the final results in fifty-nine cases of radical operation for cancer of the cervix, and the yield of quinquennial cures was about 33 per cent.

In comparing the vast outlay of surgical effort put forth in the latter class of cases with the great dangers attending the radical operation, as to both mortality and disabling results, we feel convinced that the time has about, if not quite, arrived when we shall cease to speak of any operable cases of cancer of the cervix but shall submit them all to irradiation. Certainly our results

have lead us very convincingly in this direction. As the palliative results have been so excellent and, as our statistics now appear, the actual cures have been so relatively large in the hopeless cases, it would appear illogical to submit the early, operable case to the great dangers of surgical intervention and reserve only the inoperable case for irradiation. While we still discuss operability, we are indeed turning to this method of procedure in such a small minority of cases in our clinic as to carry our statistics in this line almost to the vanishing point.

In two other classes of cases we have employed irradiation with great reluctance; and yet, as our statistics will show, this pessimism is unjustifiable. From the anatomic standpoint, the hazards of fistulas are much greater when radium is employed in cases of recurrence in the vaginal vault after hysterectomy. Of this class there have been twenty-one cases, in seven of which the patients are living, five being alive over two years. Of these, one has passed the three to four year period. Of the seven living, two have fistulas. Among the fourteen fatal cases, there were three fistulas. From these observations our apprehension as to fistulas is confirmed, for this class of case will undoubtedly be followed by a larger percentage of fistulas, another very telling argument against a hysterectomy in the borderline case if irradiation is subsequently to be resorted to.

This brings up the question, Should the surgeon resort to an operation in the questionable case, and then depend on irradiation to aid him? To act in the affirmative, we believe, is not only an unwise but a positively dangerous course. While an irradiation subsequent to a hysterectomy may save the day, it may leave in its train a distressing and possibly hopeless fistula. We cannot too urgently advise against this course. When the uterus remains as a broad wedge of tissue keeping the bladder and rectum well apart and the

TABLE 9.—CARCINOMA OF BLADDER

	Patients Living	Patients Dead
Hemorrhage:		
Complete relief	1	1
Not stated	..	1
Pain:		
Relieved	..	1
Not stated	..	1
Fistula (vesicovaginal)	1	..
Alive:	Died:	
4 to 5 years 1	Under 6 months	1
	6 months to 1 year	1

TABLE 10.—SUMMARY, LIVING PATIENTS

Hemorrhage:		
Complete relief	78	
Temporary relief	5	
Not stated	3	
Not traced	11	
No effect	1	
		98
Leukorrhea:		
Complete relief	54	
Temporary relief	4	
No effect	7	
Not traced	11	
Not stated	22	
		98
Pain:		
Relieved	24	
Unrelieved	3	
Pain caused by radium	3	
Pain not present	30	
Not traced	11	
Not stated	27	
		98
Bladder irritability after irradiation		7
Rectal irritability after irradiation		4
Fistulas:		
Vesicovaginal	4	
Rectovaginal	3	
Both	3	
		10
Local healing		49
ALIVE		
1 year	10	
1 to 1½ years	14	
1½ to 2 years	8	
2 years to 2½ years	11	
2½ to 3 years	3	
3 to 4 years	15	
4 to 5 years	10	
5 to 6 years	9	
6 to 7 years	4	
Traced less than one year	3	
Not traced	11	
		98
LIVING		
Traced	87	
Not traced	11	
Miscellaneous	4	
Operation and radium	10	
		112

domelike vault of the vagina preserved, with the carcinoma held centrally between the broad ligaments, the opportunity for successful work by the radiologist is greatly enhanced. When a hysterectomy is performed, these elastic tissues may retract to the iliac walls and thus remove the cancer outside the zone of safe irradiation.

TABLE 11.—SUMMARY (Patients Dead)

Hemorrhage:		
Complete relief	104	
No effect	6	
Temporary relief	16	
Not stated	66	
Miscellaneous	5	
Operation and radium	4	
	—	201
Leukorrhea:		
Complete cessation	56	
No effect	28	
Increased	3	
Not stated	105	
Miscellaneous	5	
Operation and radium	4	
	—	201
Pain:		
Relieved	43	
Unrelieved	41	
Not stated	108	
Miscellaneous	5	
Operation and radium	4	
	—	201
Bladder irritability after radium		8
Rectal irritability after radium		10
Fistulas:		
Vesicovaginal	7	
Rectovaginal	12	
Both	2	
	—	21
Died:		
Under 6 months	59	
6 months to 1 year	55	
1 to 1½ years	30	
1½ to 2 years	12	
2 to 2½ years	12	
2½ to 3 years	6	
3 to 4 years	3	
4 to 5 years	3	
5 to 6 years	1	
Date not stated	11	
	—	201
Local healing		60

There is a second class of cases in which cancer of a cervical stump has occurred, which is overlooked at the first operation or is the result of subsequent invasion of the stump. Four such cases appear in our series, and

all the patients are alive, two one and one-half to two years, and two three to four years after treatment. Is it likely that an excision of such an invaded stump could give as good or better results? Several other obvious facts will appear in our statistical tables which we will not refer to here.

To the energy of Mr. Ramsey, a junior medical student in the University of Pennsylvania, we are indebted for tracing out the lost cases which did not return in response to our follow-up appeals. In his conversations with some of these patients, who are now quite well, he found that one asserted that she had been cured by Christian science, one by divine healing, and one by cancer medicine. Now that they are well, we yield them reluctantly to their delusions. Such cases point also to the fallacy of statistics. It is our custom, when we are unable to follow our cases, to throw the history into the discard, leaving these cases out of court as to a final judgment as to results. Through carelessness or indifference or because a patient may have sworn allegiance to strange gods antagonistic to medicine, some of the most favorable cases may appear in the lost column. By the system of personal investigation and interview, our ratio of living patients has been raised materially.

CONCLUSIONS

1. Radium in 100 mg. amounts will yield most gratifying results if properly applied.

2. To pursue a set course without variation in the frequency of treatments regardless of the progress of the healing is hazardous.

3. To attain the best results, the first irradiation should be done under nitrous oxid anesthesia, as a more careful examination may be made, and the radium more advantageously brought in contact with the malignant areas either through radium tubes or by radium needles. Gauze packing instead of metal shields should be used for protective purposes.

4. The process of cure passes through three stages: local destruction, connective tissue formation, and hyalinization.

5. A hysterectomy after successful irradiation of an otherwise inoperable case is hazardous and does not promote the best interests of the patient.

6. Results of irradiation in cancer of the cervix practically remove this class of cases from the surgical field, although we have not yet completely yielded this point.

7. Cases of cancer of the fundus, unless too far advanced, or unless there is a critical surgical contraindication, should be submitted to hysterectomy, followed from fourteen to twenty-one days later by a light irradiation of the vaginal fornix.

8. Irradiation is dangerous immediately before or soon after an operation, or when employed in fresh operative fields.

9. Frequent repetitions of irradiation are probably unnecessary and possibly hazardous, as the foregoing observations point to the fact that the chief blow is struck at the first application.

10. The frequency of irradiation fistulas may be reduced to a minimum or almost completely avoided by the application of a well placed vaginal pack which removes the healthy tissues from the zone of intensive emanations.

UTERINE CANCER

WITH OBSERVATIONS AND RESULTS OF TREATMENT WITH RADIUM IN MORE THAN THREE HUNDRED CASES *

REX DUNCAN, M.D.

LOS ANGELES

Statistics emanating from the American Society for the Control of Cancer show that in the year 1918 there was a mortality of 11,965 from uterine cancer in the United States. Such a mortality from plague or any so-called preventable disease would cause great publicity and unlimited activity to cope with the situation. Cancer is to some extent preventable and curable in a large percentage of cases, if diagnosed and given appropriate treatment early. It is essential, therefore, to extend popular knowledge, so that women with pelvic disturbance may receive proper examination. As chronic irritation is apparently an etiologic factor in the production of cancer, the removal of all causes of chronic irritation and the extirpation of precancerous lesions would no doubt diminish the frequency of this disease. Notwithstanding the excellent work that is being done by the American Society for the Prevention of Cancer, and other agencies, there is apparently no decrease in the frequency of uterine cancer. It is important, therefore, that we give greater consideration to the earlier recognition and appropriate treatment of the large number of cases that we see.

SURGICAL TREATMENT

The value of any method of therapy can only be determined from a broad and unprejudiced study of the

* From the Radium and Oncologic Institute.

end-results, both curative and palliative, obtained in a large number of cases observed over a period of years. Until recent years, surgery has been the accepted treatment in early cases, and in the more advanced cases only palliative measures have been employed. The most recent advance in the surgical treatment of uterine cancer followed the publication by Wertheim, in 1898, of his operation, which advocates the widest removal of tissue. Such a radical operation is attended with a high operative mortality which, in the hands of the average surgeon, makes it almost prohibitive, while a less radical

TABLE 1.—RESULTS OF SURGICAL TREATMENT OF CARCINOMA OF THE UTERUS

	Number of Cases	Operability	Operative Mortality	Cures for 5 Year Period: Traced Cases	Cures for 5 Year Period: Operated Cases	Cures for 5 Year Period: Cases Applying for Treatment
Carcinoma of the cervix removed by radical abdominal operation.....	5,027	1,720	1,090			
Percentage.....	.....	34.21	18.23	35.41	19.32	11.72
Carcinoma of the cervix removed by vaginal route.....	1,205	654	192			
Percentage.....	.....	58.1	9.35	29.67	17.74	9.62
Carcinoma of the fundus..	.....	242				
Percentage.....	.....	87.78	8.19	.....	61.15	53.08
Accepting Wertheim's conclusion that carcinoma of the cervix is twenty times as frequent as carcinoma of the fundus, calculating the combined percentages for all cases the result is.....	.....	87.61	17.74	36.68	21.31	18.44

surgical procedure limits decidedly the percentage of ultimate cures. Table 1, compiled from statistics published by Janeway [1] and others, shows the results of the surgical treatment of uterine cancer, reported by a large number of surgeons in this country and in Europe. These figures require no further comment and demonstrate beyond question that the operative treatment of cancer of the uterus is, even by the most skilled surgeons, far from satisfactory.

1. Janeway, H. H.: Surg., Gynec. & Obst. 29: 242 (Sept.) 1919.

RADIUM THERAPY

In more recent years, radium therapy has developed another and a more conservative method of treating cancer of the uterus. The fact that radium may be employed in more than 80 per cent. of cases that are inoperable and recurrent, as well as in the early cases, renders it worthy of consideration in the treatment of this disease. Numerous observers report clinical cures and marked improvement in a high percentage of cases of uterine cancer treated with radium. Many of these reports have been made by men whose cases have

TABLE 2.—RESULTS OF RADIUM THERAPY IN CARCINOMA OF THE UTERUS

Reporter and Publication	Percentage of Cures		Number of Patients Treated	Reported Only Those Patients Well After More Than
	Operable Cases	Inoperable Cases		
Werner: Arch. f. Gynäk. 106, No. 1. 1916	...	14	102	3 years
Döderlein: Zentralbl. f. Gynäk., 1915, p. 185	...	23	153	1 year
Maiolo: Ann. di Ostet. 41 : 99, 1917.	...	38	42	1 to 2 years
Recasens: Arch. mens. d'obst. et de gynéc. 6 : 34, 1917	100	57	126	1 to 2 years
Heyman: XII Versamml. Mord. Chir. Ver. Christiania, July, 1919	...	27	66	4 to 5 years (85 % inoperable)
Ransohoff: J. A. M. A. 74 : 168 (Jan. 17) 1920	...	25	...	2½ to 5½ years
Janeway: Surg., Gynec. & Obst. 29 : 242 (Sept.) 1919	...	70	17	6 mo. to 3½ yrs.
Vital, Asa: Med. Ibera, numero extraordinario, 1, cong. nac. de med. y cirug., p. 62	50	38	...	3 years
Enguerido	100	43	12	

been under observation only a short time and whose experiences are limited to a few cases and a small quantity of radium, rendering their reports not sufficiently complete for statistical purposes. The results of radium therapy reported by a number of observers, whose experiences extend over a considerable time are given in Table 2.

While the cases reported above are comparatively few, and the time elapsed too short to justify conclusions, the results are encouraging and gratifying when

we consider the high percentage of clinical cures obtained in the earlier cases and the excellent results in the inoperable and recurrent cases that are otherwise hopeless.

Radium owes its therapeutic value to a hypersusceptibility of pathologic tissues and to a selective action on certain normal tissues. The destruction and absorption of the neoplastic elements under the influence of radium radiation have been demonstrated by ourselves and by numerous observers. Clinically, however, we find a marked variation in the susceptibility of uterine cancer to radiation, demonstrating that there are no doubt certain factors that are not yet thoroughly understood. While various physical and histologic studies furnish the basis of determination of dosage, adequate clinical experience, together with a thorough understanding of the histologic changes produced, and sufficient knowledge of the physical properties of radium to obtain the proper screening and dosage, are essential to permit of necessary variation in the technic and dosage to meet the requirements of each individual case. Tissue changes produced depend largely on the dosage and technic and the proximity of the tissue to the radium applicator. It is necessary to effect a thorough radiation of both the local area involved and of the entire pelvis without producing too great a destruction of local tissues or injury to the rectum and bladder.

Cervical carcinoma may spread by infiltration of the lymph vessels of the parametrium, by direct extension into the fundus and broad ligaments; by extension to the vaginal walls and thence into the paravaginal tissues and through the vesicovaginal septum into the bladder or along the sacro-uterine ligaments to the pararectal tissues and rectum. These structures all lie within the pelvis, adjacent to or below the midpelvic plane, which has anteroposterior and transverse diameters of approximately 12 cm. The uterus lies in the

pelvic axis; therefore, an applicator placed within the cervico-uterine canal will effect an even radiation throughout the pelvic cavity. The radiation must be sufficiently intense to destroy carcinomatous cells for a radius of 6 cm. (Fig. 1.) Involvement of the vaginal and paravaginal tissues may be accurately and adequately radiated by means of a suitable applicator placed within the vagina (Fig. 2).

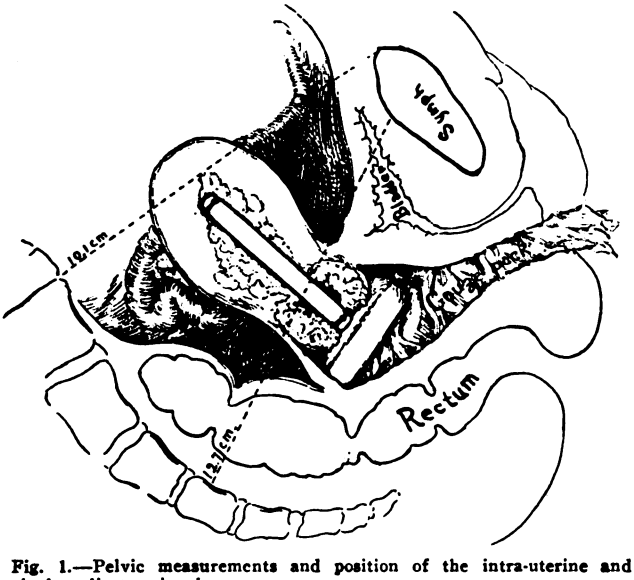

Fig. 1.—Pelvic measurements and position of the intra-uterine and vaginal applicators in place.

Knowing quite definitely the pathology and the anatomic structures involved in uterine cancer and with a rapidly increasing knowledge of the histologic changes produced by radium, it would seem but a matter of time before we should develop an accurate dosage and technic that would prove effective in destroying the neoplastic elements and produce a high percentage of cures. There is apparently an effort to standardize and simplify the dosage and technic, based on the small quantity of radium available rather than on a scientific basis and the requirements of the individual case.

Five years ago, I began my work with 100 mg. of radium element in the form of salts. This quantity has been gradually increased until I now have at my disposal approximately 1 gm. of radium element and a throughly equipped emanation laboratory. My results have improved consistently with the increase in my facilities and experience. During the last three years, we have continuously employed a larger dosage with

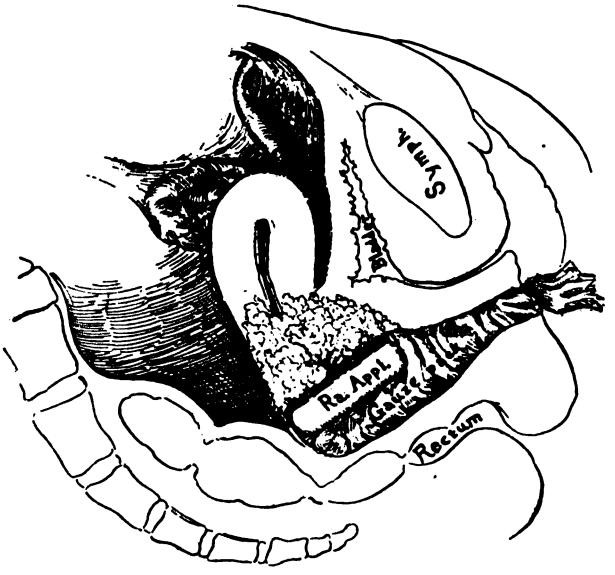

Fig. 2.—Radium applicator held in vagina by gauze pack; may be directed toward any part of the vagina or pelvis.

heavier screening, producing less local tissue destruction and more effective radiation of the entire pelvis, as evidenced by the clinical changes resulting. We are convinced that large quantities of radium or radium emanation are necessary, and we are employing applicators containing from 200 to 500 millicuries, which are left in situ for from ten to twenty hours, at each application. The total dosage employing both vaginal and intra-uterine applications averages from 6,000 to 10,000

millicurie hours. As a rule, the necessary treatment can be given in from two to four applications, made at intervals of forty-eight hours, thus requiring the patient to remain in the hospital on an average of less than one week.

TECHNIC

We have found most efficient, vaginal applicators made thus (Fig. 3):

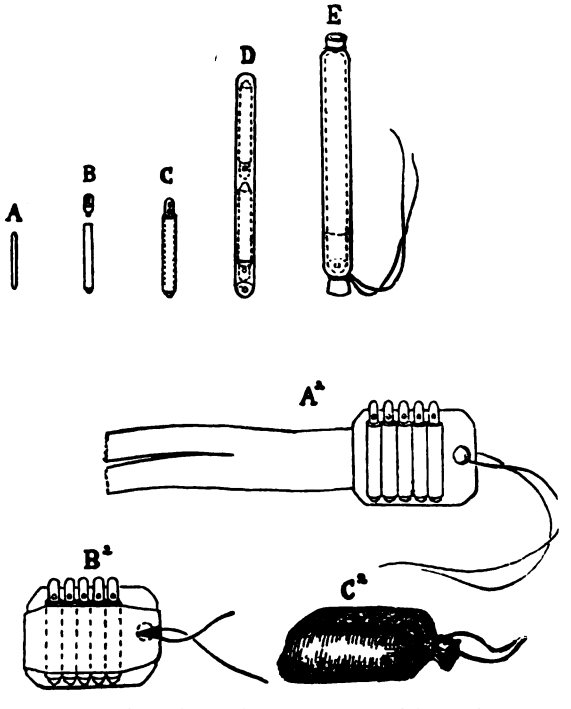

Fig. 3.—Emanation tubes and screens employed in making both intrauterine and vaginal applicators.

Radium emanation tubes of the desired activity and number and screened with 0.5 mm. of platinum, and from 1 to 2 mm. of brass, as desired, are placed on a piece of lead 2 mm. thick and of the desired shape. This is all wrapped in 1 or more cm. of gauze and covered with a rubber finger cot. Such an applicator

is easily sterilized and may be accurately placed in any portion of the vagina and retained in position by the usual gauze vaginal pack, which also holds at a distance from the applicator the area in which limited radiation is desired. Intra-uterine applicators consist of a sufficient number of radium emanation tubes, of the desired activity, placed end to end, to equal the length of the cervico-uterine canal and are screened with 0.5 mm. of platinum and from 1 to 2 mm. of brass, as desired, and are covered with 2 mm. of pure rubber gum tubing to absorb the secondary rays. This applicator is sterilized by boiling. Intra-uterine applications effect a thorough radiation of the entire pelvis, as previously described. The quantity employed is usually about 200 millicuries and the dosage from 4,000 to 6,000 millicurie hours, depending on the character and size of the uterus. Vaginal applicators are so placed as to effect a thorough radiation of all vaginal involvement, also the cervix and the parametrium on each side through the vaginal walls.

In certain cases, we have found it desirable to bury within the tumor mass a number of emanation needles containing approximately 50 millicuries each, and screened with 0.5 mm. of platinum. These needles are placed at a distance of approximately 3 cm. and are allowed to remain in situ for ten hours. In certain other cases, we have buried a number of bare emanation tubes of small activity which are not removed (Fig. 4). Needles may be employed alone or in conjunction with the vaginal or intra-uterine applicators mentioned above. More recently in a group of cases, we have employed, in addition to the local application of radium, massive doses of radium externally or deep roentgen-ray therapy. These external applications are, however, in my opinion, of unproved value.

Notwithstanding a rapid absorption of carcinomatous tissue in many cases, we have had little immediate constitutional disturbance from toxemia or other causes.

In fact, in a majority of cases, a rapid and marked improvement in the constitutional condition and the blood picture is shown.

The elimination is carefully watched during the period of treatment, and copious vaginal douches of saline solution are given daily for a local cleansing effect.

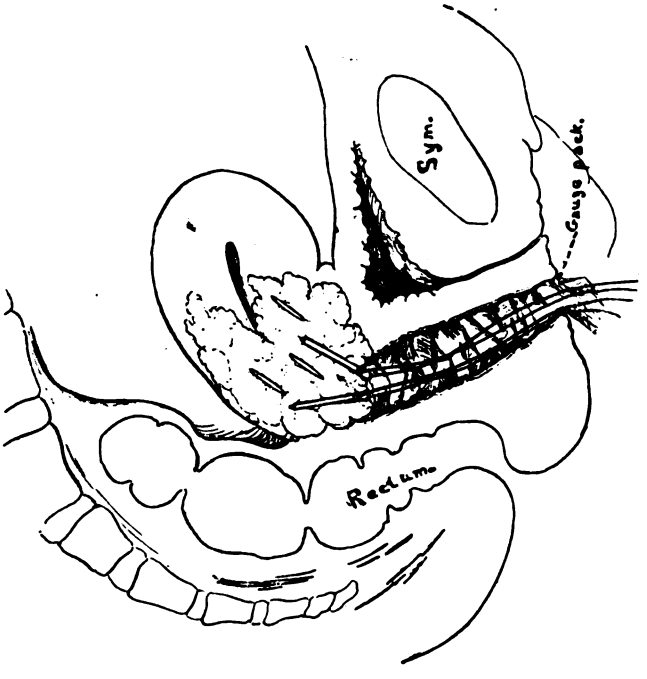

Fig. 4.—Screened emanation tubes and bare tubes buried in tumor.

The bladder and rectum are thoroughly emptied before each application of radium, and by use of the pack, as described above, are held well away from the vaginal application. We have had very little annoyance from bladder irritation, though in cases in which there is involvement of the posterior vaginal wall a more or less severe rectal tenesmus develops about ten days after treatment and continues for about two weeks. This is controlled by appropriate medication.

RESULTS

From the treatment, there results more or less temporary inflammatory reaction and local tissue changes. There results a gradual absorption of the cancer tissue, the vaginal ulceration and new growth disappear, the cervix shows local healing and more or less absorption where it has been extensively involved. The uterus reduces in size, and due to changes in the parametrium, becomes less fixed. Such improvement gradually progresses, resulting in a more or less complete recovery. Six or ten weeks must elapse before the reaction has entirely subsided and the effect of treatment is complete. Subsequent treatment may be given if indicated. Care is necessary in applying radium to a scar resulting from previous radiation, surgery or cauterization. Primary curettage or cauterization is not beneficial, and in certain cases, aggravates the after-treatment symptoms and sequelae. Our experience is consistent with that of Clark and others that surgery following an apparent cure from radium is not only unnecessary but frequently disastrous.

In reporting the results of treatment of uterine cancer, it is necessary to separate these cases into several groups based on the anatomic distribution of the disease. This is rather difficult because of the great variation in the character and location of the involvement. Though rather inadequate, but for the sake of comparison and brevity, it has seemed to me desirable to employ the grouping with which we are generally most familiar.

The treatment and observation of more than 300 patients have elicited many interesting experiences, some disappointments, and some very brilliant results. The majority of my patients were referred to me by surgeons, which probably accounts for the small percentage of operable cases that I have treated.

The time that must elapse after treatment and apparent recovery before a patient can be considered cured

is debatable. It is quite true that the longer the lapse of time, the less is the probability of recurrence. The recurrences following radium therapy are most frequent during the first year, and are apparently less frequent in subsequent years than following surgery.

Time will not permit of a discussion of individual cases, though in any large group there are many that would be of unusual interest and would be instructive. This is a detailed statistical report of the present status of 236 of my cases, treated previous to Feb. 1, 1920. I wish to say, however, that had there not resulted a single cure, the relief from pain, hemorrhage, odorous discharge and general improvement, with a consequent prolongation of life and comfort, would have been sufficient to justify treatment in practically every case.

Inoperable Cases.—There was a total number of 128, of which 51 are dead; 15 improved though with probable involvement; 6 not traced; 56, or 44 per cent., clinically well. The time elapsed since treatment in 4 cases is more than 4 years; in 4 cases, 3½ years; in 7 cases, 3 years; in 6 cases, 2½ years; in 6 cases, 2 years; in 9 cases, 1½ years, and in 20 cases, 1 year.

Recurrent Cases.—The total number was 76, of which 46 are dead, 9 improved, 4 not traced, and 17, or 22 per cent., are clinically well. The time elapsed since treatment in 2 cases is 4 years; in 1 case, 3½ years; in 2 cases, 3 years; in 2 cases, 2½ years; in 2 cases, 2 years, in 3 cases, 1½ years, and in 5 cases, 1 year.

Operable Cases.—The total number was 15, including 2 patients with early carcinoma of the fundus who are apparently well. Of the total number, 2 are dead, 13, or 86.6 per cent., are clinically well. The time elapsed since treatment in 1 case is more than 4 years; in 1 case, 3½ years; in 1 case, 2½ years; in 3 cases, 2 years; in 4 cases, 1½ years, and in 3 cases, 1 year.

Postoperative Prophylactic Cases.—There was a total number of 10, of which 6 are dead, 4, or 40 per cent., are clinically well. The time elapsed since treatment being 3½, 2½, 1½, and 1 year, respectively.

Special Cases.—Two cases of rectal recurrence followed six and ten months after treatment for the cervical involvement. Following a colostomy, the rectal recurrence was treated locally with radium. Both patients are apparently well; one nearly two years after treatment and one more

than one year. Three patients received radium therapy promptly following a subtotal hysterectomy for suspected uterine fibroid, but which sections showed early carcinomatous changes of the endometrium extending into the cervix. These three patients are apparently well. Two patients were treated following radical cautery operation. One is dead and one apparently well.

The summary of these figures shows a total of 236 patients, of whom 106 are dead, 24 improved, 10 not traced, 96, or 40.6 per cent., clinically well. The time elapsed since treatment is more than 4 years in 7 cases, more than 3½ years in 7 cases, more than 3 years in 9 cases, more than 2½ years in 11 cases, more than 2 years in 11 cases, more than 1½ years in 19 cases and more than 1 year in 32 cases.

TABLE 3.—TABULATED RESULTS OF TWO HUNDRED AND THIRTY-SIX CASES OF UTERINE CARCINOMA TREATED PREVIOUS TO FEB. 1, 1920

	Total No.	Dead	Improved	Not Traced	Clinically Well		Years Elapsed Since Treatment						
					No.	Per Cent.	4	3½	3	2½	2	1½	1
Inoperable...	128	51	15	6	56	44	4	4	7	6	6	9	20
Recurrent....	72	46	9	4	17	22	2	1	2	2	2	3	5
Operable.....	15	2	0	0	13	86.6	1	1	..	1	3	4	3
After oper...	10	6	0	0	4	40	..	1	..	1	..	1	1
Special.....	7	1	..	..	6	..	..	..	..	1	..	2	3
Total.....	236	106	24	10	96	40.6	7	7	9	11	11	19	32

CONCLUSIONS

1. Uterine cancer when given early and appropriate treatment is curable in a large percentage of cases.

2. Curative treatment depends on early diagnosis. It is necessary, therefore, to extend public knowledge so that women will consult the physician early.

3. The profession must be more keen in the early recognition of uterine cancer, and greater attention should be given to the removal of chronic irritation and the extirpation of precancerous lesions.

4. Appropriate radium therapy in recurrent and inoperable carcinoma surpasses any known therapeutic

agent. Pain, hemorrhage and odorous discharges are relieved, and there frequently occurs prompt improvement in the general condition of the patient. Life is prolonged, and there results a comparatively high percentage of clinical cures.

5. Radium therapy when employed by one with adequate facilities, skill and experience is the treatment of choice in early, or so-called operable, carcinoma of the cervix. It avoids operation with the attendant suffering, invalidism, complications and high immediate mortality. Symptoms are promptly relieved and there results a higher percentage of cures than from surgery or any other method of treatment.

6. The efficacy of radium therapy depends on an adequate quantity of radium or radium emanation and appropriate facilities, together with sufficient knowledge and experience for its proper application. Proper dosage and technic are of the utmost importance.

1151 West Sixth Street.

ABSTRACT OF DISCUSSION

ON PAPERS OF DRS. DUNCAN, SCHMITZ, AND CLARK AND KEENE

DR. WILLIAM P. GRAVES, Boston: The propaganda of general public education, though still inadequately organized, has been noticeably successful in teaching women to consult their physicians earlier in the course of the disease, while the country practitioners and family physicians are recognizing sooner symptoms which formerly many of them advised their patients to disregard. A source of encouragement is the wonderful good that radium is doing in the palliative treatment of incurable cases. If radium had never cured a case of cancer, and if it should never cure a case, its value in alleviating the suffering of cancer has already been an inestimable boon to the human race. I rarely see a case so bad that we cannot greatly help the patient, often for long periods of time. The only problem now is that which relates to the proper treatment of operable cases, and in this connection it is necessary to define what we mean by the term operable. Formerly an operable case might be defined as one in which it was possible to extirpate the uterus and diseased cervix without killing the patient and without causing injury to the neighboring organs. With the

advent of radium, even the most enthusiastic operators have modified their definition of the word operability. In deciding the question of operation in a given case, the query that the surgeon puts to himself is not, "Can I take that uterus out and not injure the patient?" but rather, "Can I cure the patient by an operation?" We should, therefore, perhaps give up the word operability in estimating our cases of cervical cancer and use the expression curability by operation. The problem in which we are at present most interested is whether to operate in a case curable by operation or whether it is justifiable to rely on the simple method of applying radium. I have been a supporter of operation in these cases. Our results in this community at least do not warrant the severe condemnation that has recently been vented on the operative treatment of cervical cancer.

Dr. A. J. Ochsner, Chicago: For many years I used the actual cautery in cases of carcinoma of the cervix, using a cautery iron of large size because it would carry the heat far beyond the point of cauterization. During the last four years since Dr. Schmitz began to treat my cases of cancer of the uterus with radium, I have reduced the number of operations. This year I have not operated in a single case of carcinoma of the cervix. The patients have all been treated with radium. The reason for doing this is this: We found among our cauterization cases many in which there was glandular involvement far beyond the reach of heat; in cases that seemed incurable the patients remained well for many years—some as long as twenty years. Undoubtedly the reason for this lay in the fact that the carcinoma in the distant glands was destroyed by the natural ability of human tissue to destroy the cancer microbe. In all probability many of the cancer microbes which are located in the glands at a considerable distance from the original cancer are destroyed directly by the radium. Dr. Schmitz advises the removal of portions of the cancer for microscopic examination. My experience has been that when portions of tissue were removed for diagnostic purposes the patients died of metastatic cancer. There is a great difference between involvement of the glands from cancer microbes which start from the cancer substance itself and those that are set free by the knife. Portions set free by the knife are put directly in the lymphatic circulation, and they will travel much farther than those that are set free by themselves in the growth of cancer, because the incision removes the barrier that nature has placed for the protection of the patient. Consequently, if one removes portions for microscopic examination this should be done in a manner to seal the lymphatics, namely, preferably by means of the electric cautery. The application of radium in sensitive patients can be done comfortably and safely under spinal anesthesia with procain. It does not frighten the patient, as a general anesthesia will, and it makes the patient perfectly

comfortable for several hours after the application of the radium. I am sure that radium has come to stay. I have mentioned the cancer microbe several times. I wish to state that Dr. John Nuzum has isolated the cancer microbe and has produced cancer from pure cultures of a specific micro-organism in many cases.

DR. FRED J. TAUSSIG, St. Louis: The interesting statistics of Drs. Clark and Keene might perhaps give the impression that there is such a thing as a routine method of application in these cases of cancer of the cervix. I hope that none of you will have that impression, because radium treatment of cancer of the cervix is just as manifold and difficult as a plastic operation. In every instance there must be a different method of application, a different filtration and a different total dosage. However, certain principles should be maintained. The treatment should be concentrated at the first application. The unfiltered radium should be applied within the cervical canal, and our efforts should be to attack the involvement of the broad ligament by filtered radiation. The pictures Dr. Keene showed of needles applied to the broad ligament rather terrify me. I would hesitate very much to make an application of unfiltered radium in the broad ligament for fear of necrosis of the ureter. As to the use of anesthesia in these cases: When there is a large mass to cauterize, anesthesia is a wise thing. When such a procedure is not necessary, we can obtain better results by morphin-scopolamin anesthesia, putting the patient in the knee-chest posture. The only way in which we can properly apply a gauze tampon to the vagina is to have the patient in the knee-chest posture, and that posture is better maintained if the patient is not under a deep anesthetic.

DR. HENRY O. MARCY, Boston: I am glad to hear from Dr. Ochsner of his demonstration of bacteria in cancer. In my investigations of cancer, we cultivated through for several generations a micro-organism which bred true and we reproduced cancer in animals. In order to disseminate the heat and the destruction through the surrounding tissues, using the thermocautery in cancer of the cervix, I packed the uterine cavity with wet cotton and then transposing the heat through the applicator conveyed in the wet cotton. One of my assistants said, "Marcy, we think that is splendid. It is like very much the way we cook our clams at the seaside, just stewing them in seaweed."

DR. HENRY SCHMITZ, Chicago: The technic of radium depends on the extent and also the irradiation required. This is limited by the bladder anteriorly and the rectum posteriorly. It will be impossible by any means at our command now to apply it beyond 3 cm. The question arises, What is going to happen to the tissue beyond the 3 cm.? We may use large amounts if we have them. Even this proposition has been stopped on account of the questions arising. For this reason

we have combined effective roentgen-ray irradiation with radium therapy. I cannot agree with Dr. Taussig that the method should be applied to the individual case. As soon as we individualize the treatment of carcinoma we begin to treat the patient and not the disease, and the results will not be so good as if we treat the disease, absolutely. There is one way, and that is by the extended radical operation; though in irradiation treatment, only by extensive irradiation can we eradicate the cancer from the pelvis.

Dr. Floyd E. Keene, Philadelphia: The point taken by Dr. Taussig in regard to the treatment of these various types of cancer certainly has merit. I tried to bring out that in the treatment of these various cases it was hazardous to proceed by rule of thumb. We give anesthesia with the definite idea of determining exactly what the conditions are, and we are governed by the conditions we find as to what type of treatment we shall use. The methods I showed were merely principles we try to apply. The details of treatment are brought out in my paper. As regards the use of the needles, Dr. Taussig has good grounds for his fears. I can only say that, in the treatment of a considerable number of cases in which we have used the needles, we have thus far had no bad results.

Dr. Rex Duncan, Los Angeles: I am convinced that if we do not get a single cure, the palliative results of radium are superior to anything else we have. I am confident, from my experience, if we can obtain the excellent results we apparently do in inoperable cases and the small number of operable cases treated, that radium should be given a more fair and general trial in the treatment of early cervical carcinoma. I believe that cervical carcinoma, at least, is not surgical and should be treated with radium.

I cannot agree with Dr. Schmitz. I do believe that while it is true we are treating a disease, we are also treating a human being. Many factors must be considered, and we cannot kill our patient in order to cure the cancer. Therefore, we have to modify our technic and dosage to meet the general condition of the individual patient, and also to meet the great variations in the distribution of the disease as it occurs in different patients.

SPLENECTOMY IN SPLENIC ANEMIA AND BANTI'S DISEASE

WILLIAM J. MAYO, M.D.
ROCHESTER, MINN.

Splenic anemia is characterized by an enlarged adherent spleen, a secondary type of anemia, and leukopenia. The etiology of splenic anemia is unknown; rather, let us say, if we know the cause the condition is not called splenic anemia, but is considered part of the disease of which it is one of the manifestations. This syndrome in children was described by Gretsel, in 1866, and various observers had called attention to sporadic cases; not until the publication of Osler's paper, in 1900, however, was the attention of the American medical profession drawn to the disease, and our knowledge of it may be said to date from that time.

While splenic anemia has quiescent periods, it eventually terminates in death, often from an intercurrent malady which the condition invites. The anemia is subject to considerable variation. When extreme, it is usually the result of intercurrent gastric hemorrhages. Leukopenia is a rather constant feature; the white cell count is usually well under 5,000, the average being 3,500, although occasionally it is much higher. We have operated on several patients in whom the white cell count had run rather steadily above 10,000. Pathologically the spleen shows generalized fibrosis and thrombophlebitis with atrophy of the pulp cells.

In 1883, Banti described an enlargement of the spleen associated with portal cirrhosis of the liver. He believed that the changes in the spleen, which consisted of a gradual conversion of the parenchyma into fibrous tissue with atrophy of the cellular elements and degeneration of the blood vessels, were the result of an infec-

tion. The fact that an unknown cause is essential to the diagnosis at once shows the lack of essentials in Banti's understanding of the subject. Most observers are now of the opinion that Banti's disease is merely a late stage of splenic anemia, presuming that the etiologic agents which are removed by the spleen from the blood stream affect not only the spleen, but also the liver terminally. As we discover one by one the various initiating causes of these changes in the spleen the number of cases of Banti's syndrome is reduced. Banti not only laid stress on unknown etiology, but also on the terminal changes in the liver. It may be stated, however, that the type of cirrhosis produced is portal, showing that the cause of the disturbance is carried to the liver through the portal vein. The evidence at hand leads to the belief that both the anemia and the cirrhosis of the liver are the result of the pathologic condition of the spleen, rather than of toxic material supposedly removed from the blood, and that the exciting cause of the splenomegalia may have little to do with the changes in the blood and liver. As there is enlargement of the spleen in many cases of primary cirrhosis of the liver, there is need for more accurate observation in order to clear up points which must otherwise be conjectural. At the present we may argue that if the discovery of an enlarged spleen is made first, and of the portal cirrhosis later, the condition is splenic anemia. On the contrary, if there is a history of alcoholism or pepper addiction and the condition of the liver is noticed first and that of the spleen later, we may say that the trouble is primary in the liver and that the splenomegalia is secondary to the liver changes. In the two extremes this method of classification will answer clinically, but unfortunately in many instances the history and physical findings are confusing and indeterminate.

Warthin and Dock have made careful observations in some cases of splenomegalia of the splenic anemia type which had progressed to the secondary condition

with the changes in the liver described by Banti. In the cases presented by them are splenic fibrosis, hepatic cirrhosis, stenosis, and calcification of the portal system causing passive venous chronic congestion and hyperplasia of the hemolymph nodes which are closely associated in function with the spleen. Warthin and Dock lay great stress on thrombophlebitis and believe that the generalized thrombosis is secondary to portal thrombophlebitis and that this condition itself is the result of chronic infection. Warthin summarized the findings thus: "Splenic anemia and Banti's disease must be regarded as coordinated symptom-complexes and not individual disease entities," a statement with which I quite agree.

The spleen is enlarged in cases of biliary cirrhosis also, especially in the mixed forms. I have been impressed with the futility of the morphologic classification of the hepatic cirrhoses. There are many cirrhotic pictures, just as there are many patterns of wall paper or carpets. Brushing aside the familiar classification of the cirrhoses of the liver in which variations in the morphology lead to unnecessary confusion, there are fundamentally but two hepatic cirrhoses:

1. Portal cirrhosis, in which the toxic material reaches the liver by way of the portal vein and in which the connective tissue is deposited around its branches. Death is caused by portal-circulatory obstructions, ascites, and gastro-intestinal hemorrhages without jaundice until shortly before death.

2. Biliary cirrhosis, caused by infection of the biliary ducts in which the connective tissue is deposited around the ducts and causes jaundice, but without ascites or hemorrhages until shortly before death.

We understand best the atrophic type of portal cirrhosis of Laënnec, but there are many cases, probably half or more, in which the liver is typically cirrhotic, is not decreased in size, but is even increased, as seen in the beer drinker's liver in contradistinction to the hobnail, or gin livers. While the liver in portal cirrhosis

may be large or small, it usually is rough; at times, however, deposits of fat smooth out the surface roughness and lead to confusion of type.

REDUCTION OF THE PORTAL CIRCULATION BY SPLENECTOMY

In portal cirrhosis the spleen may play a prominent part in the etiology, and splenectomy in properly selected cases may be of great benefit. By splenectomy not only the supply of toxic material, if there be such, is cut off from the general circulation but also the portal blood stream is reduced by subtraction of the amount of blood poured into the portal vein from the spleen, about 25 per cent. of the total under normal conditions. After the removal of some of these huge spleens an enormous reduction of the portal circulation takes place, so that the hepatic cells may be relieved of a sufficient overload to enable them to function normally, and moreover the liver under favorable circumstances has the power of regeneration. Our experience with portal cirrhosis of the liver secondary to splenic anemia encouraged us to remove the spleen in some cases of primary portal cirrhosis. In all, eleven patients with portal cirrhosis were subjected to splenectomy with four deaths in the hospital. All of these patients were in the last stages, with ascites, hemorrhage from the stomach, and so forth. Only in such grave cases did we consider the operation justifiable. After removal of the spleen the omentum was spread in the denuded splenic area and fastened in the abdominal wound in order to give the additional benefits of the omentopexy of Talma-Morison and Drummond which we have occasionally found of great benefit in relieving the ascites and other evidences of portal obstruction. Four of these patients were markedly benefited. One patient is now alive after five years. In early operations the operative mortality would be small and the end-results much better.

Biliary cirrhosis usually of the obstruction type of Adami must be considered in this connection. As pointed out, the connective tissue in this disease is deposited around the biliary ducts from infection, commonly from the extension upward of common duct infections from gallbladder disease. Infection from obstruction pancreatitis extending to the biliary ducts is also an occasional source of biliary cirrhosis. Sometimes the infection of the duct is focal in origin, and is carried to the biliary channels by the blood stream. The biliary cirrhosis may be complicated by portal cirrhosis, perhaps secondary to the pathologic condition of the spleen which has been caused by, or is a part of, the primary biliary cirrhosis. It is difficult in some cases of biliary cirrhosis to exclude latent hemolytic icterus as a contributing factor. In twenty of thirty-two cases of hemolytic icterus in which we performed splenectomy, gallstones were present, usually bile pigment stones the result of the enormous amount of pigments derived from the unnecessary red blood cell destruction in the spleen. Splenectomy was performed in six cases of primary biliary cirrhosis with greatly enlarged spleens. In these cases the cause of the biliary infection, so far as could be learned, had been removed previously, such as gallstones, and focal infections, without marked relief. All of the five patients who recovered were greatly benefited; three are alive two years; two, three years, and one, five years after splenectomy.

Hemorrhage from the stomach, so disturbing a feature of splenic anemia, is not always relieved by splenectomy, but is greatly reduced in frequency, and the majority of the patients never have hemorrhage after splenectomy. There are two known causes for hemorrhage of the stomach in these cases, first, esophageal and gastric varicosities, the result of portal obstruction, and second, toxic conditions, undoubtedly hepatic in origin, which result in extensive superficial gastric mucous erosions of the Dieulafoy type. The prospects

of relief by splenectomy, however, depend not only on whether the spleen is the primary cause, but especially on the condition of the liver. We have seen patients with very advanced cirrhosis of the liver who have been relieved of the ascites and gastric hemorrhages and have recovered marvelously after removal of the spleen. In one such case, the patient, a physician, operated on by C. H. Mayo, had what appeared to be a terminal condition of splenomegalia and hepatic cirrhosis. He is well and in active pursuit of his profession more than eleven years after splenectomy. Balfour, in an article on gastric hemorrhages of splenic origin, reports in detail a case in which the removal of a moderately enlarged spleen checked gastric hemorrhages of many years' duration from which the patient was almost exsanguinated. Five previous operations of various kinds had failed to cure. The patient has remained well for more than four years. We have since had a similar experience. Sherren, Cushing and others have called attention to the fact that after the removal of the spleen for splenic anemia an occasional patient has a recurrence of hemorrhages. Of our seventy-one patients splenectomized for splenic anemia, eight died from gastro-intestinal hemorrhage during the next ten years. As Balfour points out, the hemorrhages are often the result of toxic substances produced in the liver, and the removal of the spleen will not always restore the liver to normal.

SPLENECTOMIES

Up to Jan. 1, 1921, 249 spleens were removed in the Mayo Clinic for all causes, with a mortality of 10+ per cent.

Splenic Anemia.—Of the 249 splenectomies, seventy-one were for splenic anemia of unknown origin, with nine deaths. In addition splenectomy was performed in thirty-eight cases for splenic anemias of known origin. These cases deserve some attention.

Chronic Sepsis.—We have removed eleven spleens which had become greatly enlarged in the course of chronic general sepsis following septic arthritis, tonsillitis, phlebitis, and osteomyelitis, with three deaths in the hospital. The other patients were cured or greatly benefited.

Syphilis.—Splenomegalia is often found with chronic syphilis, especially in the cases in which thorough treatment fails to maintain a negative Wassermann reaction. Some observers who have had wide experience with syphilis have believed that the large majority of cases of so-called splenic anemia are syphilitic in origin. In the syphilitic spleen, generalized fibrosis and thrombophlebitis are found as well as specific changes, especially modified forms of gumma; frequently *Spirochaeta pallida* can be demonstrated. We have removed the spleen in six cases of this kind, with one death in the hospital. Patients who had resisted thorough syphilitic treatment, and in whom chronic anemia was a manifest sign, were at once made amenable to treatment and quickly recovered.

Characteristic portal cirrhosis of the liver may be an end-result of syphilis, and finally death results from circulatory obstruction, ascites, hemorrhage from the stomach, and so forth, quite like the other cases of splenic anemia.

Splenic Anemia in Children and von Jaksch's Disease.—Von Jaksch has described an enlargement of the spleen in infants due to malnutrition which usually disappears on proper feeding, but some of these patients do not get well and the enlarged spleen and chronic anemia are carried into early childhood. We have removed eight spleens in such children without an operative death, and when the condition has not been too advanced cure has followed. The spleens removed have shown the characteristic generalized fibrosis and thrombophlebitis.

Malarial Spleen.—Chronic malaria results in a splenomegalia with generalized fibrosis and thrombo-

phlebitis that we recognize as a form of splenic anemia; ultimately some of the patients develop cirrhosis of the liver, ascites, hemorrhage from the stomach, and the characteristics described by Banti. The removal of the greatly enlarged spleen of this type relieves the anemia. The experience of Jonnesco in Roumania and of Mourdas in Russia, as well as that of other observers, has shown that the malarial treatment becomes much more effective and that patients who were apparently incurable have been restored to health following splenectomy. The mortality has been considerable following splenectomy in these cases, but this is also true of the entire group of splenic anemias since the spleen is often adherent and may require unusual skill and care for safe removal. This is shown by the mortality in our series, which was much higher than that in any of the other pathologic conditions for which the spleen was removed. It is understood, of course, that the removal of the spleen does not cure the malaria, but removes a very serious complication, which is one of the means by which the death of the patient is brought about.

Chronic Splenomegalia.—Finally, there is a type of chronic splenomegalia more common in women than in men, which exists for years without great detriment to the patient beyond the weight of the enlarged spleen. In the cases that I have observed, however, chronic anemia has eventually developed, and in a few in which I have operated I have found the definite changes characteristic of splenic anemia. I think we must conclude that all such cases are quiescent types of splenic anemia. The confused state of our knowledge at least brings one thought to mind, that the patient with an enlarged spleen should be looked on as potentially ill, and unless the cause can be shown and relieved, splenectomy may be considered. There is no sharp dividing line between these cases and certain varieties of benign tumors, splenic apoplexy, and cystic disease without traumatism in which a definite pathologic condition exists in the blood vessels and may give rise to

acute conditions such as intraperitoneal rupture of the spleen.

The mortality and end-results are satisfactory, considering the nature and condition of the patients subjected to operation. All of the patients we operated on were otherwise incurable and progressing to a fatal issue. The death rate from splenectomy in such cases will be high, and not all patients who recover will be greatly benefited. The later in the course of the disease the splenectomy is performed, the closer terminal and incurable conditions will be found. How can we expect to cure all the pathologic conditions found at necropsy? We cannot turn back the hand of time in disease, but early operation will give a low mortality and cure a higher percentage of patients than have been cured in the group which I have considered here.

TECHNIC OF OPERATION

In performing splenectomy in the Mayo Clinic, the technic of Balfour is employed. The patient is placed on a table, tilted slightly to the right. The midline incision of Ochsner and Percy is employed. It gives ready access to the spleen, and permits necessary operative procedures on the gallbladder and appendix and makes it possible to remove a specimen of the liver for microscopic examination. The spleen is rapidly loosened manually from its attachments to the diaphragm and to the outer parietes. It is drawn down into the abdomen, and the space is packed with a large, warm, moist gauze compress. While the spleen is retained in the abdomen to act as a barrier against the intestinal protrusion, the vascular connections between the spleen and the stomach are ligated, care being taken not to injure the stomach, which happened in two cases in our experience, one patient dying as the result of septic leakage. The inferior margin of the spleen is tilted out of the abdominal incision and the attachments at the splenic flexure of the colon detached and ligated. The spleen is then

lifted out of the abdomen and the omental and peritoneal attachments anteriorly are divided with a sharp knife, inspected, tied, and separated, exposing the vascular pedicle accurately. The spleen is turned partly turtle in order to expose the pancreatic notch of the spleen on the outer aspect of the pedicle, and the tail of the pancreas is freed. The splenic pedicle is then grasped in such a manner as to compress the artery between the thumb and the finger and is held during a few heartbeats in order to allow the venous blood to drain from the spleen back into the general circulation. Two forceps are then placed on the proximal side, and one next the spleen, and the pedicle is divided. A catgut tie is made in the groove of the deeper forceps as they are removed, and a second tie in the groove of the second forceps as they are removed. With fine catgut on a needle the separated peritoneal tissues and other loose tissues along the upper surface of the pancreas are drawn together and some small bleeding vessels in that situation are secured. The pack is then removed. As a rule there will be but little hemorrhage of the deeper attachments. Occasionally, however, there is bleeding; the catgut suturing should then be carried down through these spaces in a snaking stitch in order to compress the bleeding points which usually cannot be caught in this deep situation and tied separately. Care should be taken in coming to the diaphragm not to tear a hole through into the pericardium or pleura, an accident which happened in one of our cases, fortunately without bad result. If the needle is caught in the bleeding tissues on the under surface of the diaphragm with about 15 cm. of catgut slack in the fingers, the needle may be allowed to pass up with the diaphragm on expiration and be caught as it comes back during inspiration.

ABSTRACT OF DISCUSSION

DR. ALBERT J. OCHSNER, Chicago: It seems as though these splenic conditions which Dr. Mayo has described are, in fact, the result of a physiologic attempt of the spleen to do its work, and that it has gotten the worst of it. We suppose that

the spleen receives blood which is defective to a slight extent, and passes it out into the general circulation in a purified condition. Many irritants may enter with the blood. The most important are the irritants from malaria and alcoholic poisoning. The inability of the blood-forming organs to produce normal blood forces the spleen to dispose of great quantities of abnormal blood. In Banti's disease, in splenic anemia, undoubtedly the enlargement is the result of an attempt to do more work than the spleen should be called on to do. The other changes, the increase of connective tissue, the arteriosclerosis, the destruction of the lymphoid nodules, are undoubtedly the result of the overload of the poisonous substances that have entered the spleen. In pernicious anemia there is some infection that has interfered with the blood-producing organs and has produced a blood that overloads the splenic activity. In these cases of Banti's disease and in splenic anemia, it is likely that this irritation has been of such long standing that we have overlooked it. As Dr. Mayo stated, usually a time comes when there is not enough of the normal spleen left, and then this condition changes and the anemia occurs, because then the spleen begins to destroy blood that it should not destroy. I have followed and examined the spleens in 129 cases. My observations agree, so far as the conditions are concerned, very closely with those of Dr. Mayo. I am thoroughly convinced that his conclusion is correct. When we supply new blood by blood transfusion, the blood-producing organs are relieved of their work temporarily. They may be relieved to such an extent they will begin to do their work again normally. Then the spleen kills off some of the good blood. Take out the spleen, and in a certain percentage of cases the other lymphoid organs will be able to take care of that work, and things go on very well.

Dr. William J. Mayo, Rochester, Minn.: We know that the spleen is not necessary to life; no great harm comes to an individual if the spleen is removed, and possibly indications for its removal will be found much more frequently in the future than in the past. The operation is not so dangerous as it is pictured, but a definite technic is necessary. The midline incision of Ochsner and Percy is altogether the best. It permits the ready removal of the spleen, the inspection of the gallbladder and appendix, and the exploration of the abdomen for associated lesions. It permits also the removal of a piece of the liver for microscopic examination, which is often desirable in order to obtain additional information. The technic of splenectomy followed in our clinic is that described by Balfour (*Surgery, Gynecology and Obstetrics* **23**:1 [July] 1916).

IN WHAT CASES DO UTERINE FIBROIDS STILL REQUIRE OPERATIVE REMOVAL?

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In four of the most important fields of gynecologic work, cancer of the uterus, fibroids of the uterus, inflammatory disease of the adnexa and disorders of menstruation, the last five years have witnessed a remarkable trend away from operative procedures. So pronounced has been this tendency that before long the general surgeon may leave us to our own resources, particularly if gynecologists cease to poach on the domains of their fellow surgeons. It may well lead to the better definition of gynecology as a specialty, which is the more needed because of the way in which many of our best universities have separated it from its twin sister, obstetrics. It is well, however, to hold a rein on our enthusiasm, lest the current of nonoperative treatment carry us too far in the opposite direction. I have, therefore, felt it pertinent to analyze from our present experience the indications for treatment in one of these fields, uterine fibroids. The basis for my opinions is (1) a study of personal experiences during the last three years, during which time I have had radium available for treatment; and (2) a review of the numerous reports on this subject from clinics here and abroad.

COMPARISON OF RESULTS FOLLOWING TREATMENT BY OPERATION AND RADIUM

Since January, 1918, I have treated, either by operation or with radium, 123 cases of uterine fibroids. A considerable number of additional cases were seen by

me during this time; but either these patients did not require treatment or refused it for one reason or another. Of the 123 patients eighty-seven were operated on and thirty-six were given radium treatment. The analysis of indications and the results of treatment can best be shown in the accompanying tables. So far as I know, no one has heretofore attempted to differentiate therapeutic indications according to race. Certain striking differences between the negro and the white race are manifest. It will be noted that while only five out of sixty-eight negro women were found suitable for radium treatment (7.3 per cent.), the proportion among the white was thirty-one out of fifty-five (or 56 per cent.).

TABLE 1.—INDICATIONS AND RESULTS OF TREATMENT IN OPERATIVE CASES

			Indications for Operation							Results		
	Number	Average Age	Size	Pus-tube	Ovarian Cysts	Prolapse	Desired Children	Operation Preferred	Other Reasons	Good	Phlebitis	Death
White.....	24	41.9	4	1	1	4	3	3	8	22	2	0
Colored...	63	36	35	12 (5)	6 (2)	1	0	0	9	60	0	3
Total....	87	38	39	13	7	5	3	3	17	82	2	3

TABLE 2.—INDICATIONS AND RESULTS OF TREATMENT IN RADIUM CASES

			Indications for Radium		Results		
	Number	Average Age	Size	Operation Contra-Indicated	Good	Complications	Failure
White.....	31	42.5	29	2	28	2	1
Colored.....	5	35.0	3	2	4	0	1
Total.....	36	41.5	32	4	32	2	2

In explanation of these tables it should be stated that, when a tumor was large enough to extend more than half way between the symphysis and the umbilicus, operation was advised, provided no contraindications, such as serious heart or kidney complications, existed.

The bracketed figures under pyosalpinx and ovarian cyst mean that the condition existed in addition to the size of the tumor to justify operative removal. Under the head of "other reasons" in the operative group were included carcinoma of the cervix, 2 cases; submucous fibroid in vagina, 3; intraligamentous fibroid, 2; ectopic pregnancy, 2; pregnancy, 1; appendicitis, 1; wrong diagnosis, 1; tuberculous peritonitis, 1. In one case with mild hyperthyroid symptoms, I desired to avoid the castrating effect of radium and hence preferred a subtotal hysterectomy.

In the thirty-six radium cases, the dosage ranged from 800 to 1,750 mg. hours, with an average of 1,250 mg. hours. Usually 75 mg. hours were applied within the uterus in silver and brass for about sixteen hours. In three instances of somewhat larger growths, roentgen ray was used in addition to radium; but in one of these, the menorrhagia still persisted and the patient decided to be operated on. In ten patients the radium was applied in the vaginal fornix instead of intrauterine. Additional treatment was given in but one case. As to amenorrhea the rule was that in patients over 40, no further menstrual flow occurred after radiation, whereas in younger patients one or two periods occurred before cessation of flow. In some of these younger persons, menstruation returned in from six months to a year, but was not excessive in amount. In three instances the flow never ceased but became normal in amount. Excessive bleeding was not the only symptom that justified treatment. Backache and pressure against the rectum were, in two instances, greatly relieved by the marked diminution in the size of the tumor. The diminution in the size of the tumor continued for several months after the original treatment. In this respect, the reaction of fibroids to radiation has a certain similarity to that of keloids in which a slowly progressive absorption has been noted for long periods of time.

One of the outstanding contrasts in these two tables is the frequency of complications in fibroids among colored women. This is due in part to the greater frequency of gonorrheal infection but also to the inherently earlier appearance and more rapid growth of fibroids in the negro race. I do not think this point has been sufficiently emphasized, though doubtless all gynecologists living in Southern states will bear witness to this fact. The age incidence in my series was more than six years less in the negress than in the white woman, and yet in spite of this fact large tumors reaching to the umbilicus, or above it, were about nine times as frequent among the colored as among the white race. These large tumors, particularly when associated with infected tubes, often affected the heart and kidney function, and their removal was attended with great technical difficulty resulting in a relatively high mortality (4.7 per cent.). At the St. Louis Negro City Hospital, we have occasion to see many women die without being operated on as a result of fibroids or complications produced by fibroids. When we consider how rarely we find a white women in whom fibroids have caused death, we must agree that the condition is a far more serious one in the negro race, and that palliative measures will only rarely be suitable for this group.

In one respect, however, the operative treatment of fibroids among white women presents greater danger. This is in the complication with thrombophlebitis. While I have not time to look up definite statistics on my fibroid cases in which operation was performed previous to 1918, I do not recall a single instance of thrombophlebitis in about 300 colored women operated on for fibroid during the last fifteen years. Among white patients the incidence of this troublesome complication is about one in every twenty or thirty cases. In Hornung's[1] recent analysis of the cases at Kiel,

1. Hornung, R.: Zentralbl. f. Gynäk. 45: 381-389, 1921.

thrombophlebitis occurred fourteen times in 447 operations, about 3 per cent. In my own series, it occurred twice in twenty-four operations. This is to my mind an important additional reason for preferring radiation to operation in white women. At present, we have no way of preventing these unfortunate thromboses, and assuredly they are the bugbear of all gynecologists. With radiotherapy we do not have to fear this trouble.

From a practical standpoint we are constantly brought face to face with human fears and prejudices. The dread of the knife has in the past kept many patients from consulting a physician, or, after they have consulted him, it has made them put off treatment month after month. How often have we all heard the story, "Yes, doctor, I noticed the lump about six months ago, but I thought it would go away, and I knew you would say I should have to be operated on." If it is true concerning cancer that "in the early recognition and treatment lies the *hope* of cure," it is well to emphasize to our patients that in the case of fibroids "in the early recognition and treatment lies the *ease* of cure." It seems to me that already among the more educated classes this knowledge of other methods of treating fibroids besides surgery has permeated and has led more patients to come promptly for the relief of symptoms. Certain it is that many of my patients would have refused operation but did not object to the simpler, safer and usually equally effective treatment with radium. I should not be surprised if, in the course of the next decade, among white women, the percentage of cases in which radium was sufficient to effect a cure would increase from the present 40 to 50 per cent. to almost 80 or 90 per cent.

As to the expectancy of cure after radium or roentgen-ray treatment my own experience is too recent to justify any statement but there are ample reports from current literature [2] on this point: Zweifel,

2. Gellhorn, G.: Am. J. Obst. & Gynec. 1: 767, 1921. Detailed references to recent literature under this head.

222 fibroids; Clark, 150; Kupferberg, 325; Kelly, 182; Steiger, 59; Weibel, 53; Clarke, 50; Brettauer, 32; Miller, 26. These men using radiotherapy, either in the form of roentgen ray or radium, attained a symptomatic cure in all but forty-eight out of these 1,099 cases of fibroids. This would make a percentage of cure of 95.5 per cent., assuredly a sufficient justification for the more extensive adoption of this form of treatment.

CONTRAINDICATIONS TO RADIOTHERAPY

And now let me briefly state the contraindications at present existing to radiotherapy.

1. *Size.*—When the mass of the fibroid uterus is more than 12 cm. in its average diameter, operation is usually to be preferred. I think it better to employ this form of description rather than the distance of the tumor above the symphysis, since a relatively small uterus may be situated high and reach almost to the navel, whereas a large fibroid filling the whole pelvis may barely be felt from above.

2. *Location.*—Submucous fibroids protruding through the cervix, subserous fibroids of considerable size with a definite pedicle, cervical fibroids and intraligamentous fibroids had better be operated on. I do not, however, agree with Zweifel in excluding fibroids that are merely pressing against the rectum or bladder, provided they are not already partly wedged into the pelvis. In several instances, I have seen such pressure symptoms completely disappear after the shrinkage produced by radiation.

3. *Degeneration.*—Rapidly growing tumors, calcified fibroids, necrotic fibroids and those complicated with malignancy are not suitable for radiation.

4. *Age.*—There is no absolute contraindication to radiation on account of age except so far as the desire for children or a preservation of menstruation makes myomectomy or subtotal removal of the body of the uterus preferable.

5. *Complications.*—Pyosalpinx and ovarian cysts, except small retention cysts, are a positive contraindication in my opinion. Often we encounter difficulty in differentiating between a laterally situated fibroid that is somewhat adherent and an adnexal mass. It is well not to be in too great a hurry. In those cases in which there is still reasonable doubt, I would prefer operation to radiation, for it will take many more reports than those of Van de Velde [3] to convince me that radium treatment of pyosalpinx is anything more than a very dangerous experiment.

Such in the main are the contraindications to radiation. It is evident that only the careful diagnostician will be able to differentiate between the cases that are suitable for operation and those that are suitable for radiation. It is, therefore, greatly to be deplored if the general practitioner should, without further consultation, send all his fibroid patients to the roentgenologist for treatment, or even worse, if the roentgenologist should undertake the treatment of fibroids with roentgen ray before a careful pelvic examination by some competent person has been made.

As to the use of the roentgen ray in fibroid cases, I cannot speak from personal experience but from what I have seen of the cases treated by others with roentgen ray, I must share Clark's [4] decided preference for the intra-uterine application of radium in these cases. Radium may cause leukorrhea for a period of time; but it does not produce the pronounced intestinal derangements (vomiting, cramping, catarrhal stools) that so often follow roentgen-ray treatment. Furthermore, it seems to be more certain in its results. In two of my cases, roentgen ray in the hands of competent men had failed to produce amenorrhea, while a single application of radium promptly brought about

3. Van de Velde, T. H.: Zentralbl. f. Gynäk. **44**: 994 (Sept. 4) 1920.

4. Clark, J. G.: The Treatment of Myoma Uteri with Radium, J. A. M. A. **73**: 957 (Sept. 27) 1919.

the desired result. The diagnostic curettement which should always attend a radiation for fibroid makes the intra-uterine application of radium a simple therapeutic measure.

CONCLUSIONS

Let me, in conclusion, emphasize these points: Radiotherapy of fibroid tumors is destined more and more to displace operation as patients learn to come early before contraindications to its use have arisen. In the negress, however, surgery will still have to be generally employed in fibroid tumors on account of their earlier, more rapid and more complicated development. Radiotherapy is a measure that has definite contraindications and the selection of cases suitable for such treatment should remain in the hands of the trained gynecologist.

ABSTRACT OF DISCUSSION

DR. GEORGE GRAY WARD, JR., New York: The use of radium in fibroids is a method of great value, but we should appreciate the limitations. We shall now get these cases very much earlier. Fear of the knife will not keep these patients away. And as we get them earlier they will consequently be more frequently in the child-bearing age, and the question of sterility will be a very important factor to bear in mind. Therefore, the operation of myomectomy must not be forgotten, as probably the most valuable method for use in child-bearing women who have fibroids. Radium has increased the importance of the operation of myomectomy. Formerly we feared overlooking a fibroid so small as not to be visible at operation, but which might later cause trouble. Now we need not fear this, because we have radium to fall back on should a tumor subsequently develop. Therefore, there would be no need of a second operation. We have also found radium of value in large fibroid tumors associated with severe hemorrhages, producing a marked anemia, so that the cases were not suitable for operation on account of the grave risk to life. In these cases we have used a preliminary application of radium to check the hemorrhage and allow the patient to build up and, therefore, become a better operable risk. We have used radium in the form of a tandem application in these cases, that is, two tubes are placed, one above the other, so as to irradiate a larger surface. In the case of large fibroids we use 1,500 mg. and in the cases of young women when we do not wish to cause cessation of menstruation, we have used from 200

to 500 mg. hours, according to the size and conditions. I wish to call attention to two important dangers: If the bladder is allowed to become markedly distended during irradiation, on account of its proximity to a small uterus, it will be affected through the uterine wall; and necropsy has shown that if the intestine is adherent to a small uterus, irradiation caused a burn of the intestine, which produced ulceration and death.

DR. WILLIAM J. MAYO, Rochester, Minn.: Radium treatment is not conservative. It is quite as destructive as operation, and sometimes more so, because it destroys the function of the ovaries as well as that of the uterus. If hysterectomy is performed, one or both ovaries can be saved in 50 per cent. of the cases. I agree with Dr. Taussig in his limitations on hysterectomy. Radium can be used in a large number of cases of the type in which hysterectomy has been thought necessary. But the desirability for continuation of the function of menstruation in young women must be considered, especially in young women who desire motherhood. If enough radium is used to cause shrinkage in tumors of considerable size, it is just as destructive as hysterectomy, or even more so. It has been urged against myomectomy that it is more dangerous than hysterectomy. Some years ago I looked up the records of 741 cases in which myomectomy had been performed in the clinic, and found that the average mortality had been less than 1 per cent. Six hundred and nineteen of these myomectomies were abdominal, with only 0.6 per cent. mortality. The remainder were vaginal myomectomies with a little over 2 per cent. mortality. About half these patients were married. Twenty-one had raised one child each, and seven had raised two or more children. Fourteen of these patients were pregnant at the time of operation; eleven went to term and bore living children. The disturbance which occurs in fibroid tumors in women who are pregnant is usually due to changes in the circulation, and the operation is comparatively easy in these cases. Premature expulsion of the fetus occurred in but three of the fourteen cases, and none died. Only nineteen of the myomectomized patients had second operations, some of which were performed a number of years afterward. In the meantime, several of the women had borne children. Most of the second operations were for infections. Myomectomy is the operation of choice for fibroids in women under 35 or 40. Hysterectomy is best for women over 50 if there is a suspicion of malignancy, and for women having large tumors. Radium has a great field of usefulness for smaller tumors that cause hemorrhage at the menopause period.

DR. HENRY O. MARCY, Boston: At the International Medical Congress in Washington, in 1887, this subject was discussed with extreme care. I rather reluctantly felt obliged

to ask Apostoli of Paris to come over and give his address on the application of electricity. I had been prejudiced against his method, perhaps unjustly, because Dr. Ephraim Cutter had devised a method somewhat similar, except that he thrust one pole into the large tumor through the abdominal wall and then applied this high current into the uterus. Apostoli had his application diffused through a water pad. Dr. Keith of Edinburgh had removed seventy-two large uterine myomas without a single death. He said, "I am sure we will see no more operations for the removal of fibroid tumors." Apostoli has settled the problem, and the curability is absolute, with entire safety. I asked Apostoli to come to my hospital here and apply the method. He did it. I was convinced I must be wrong. I purchased the apparatus and made 600 applications with the greatest of care, measuring the current and the time, and every patient insisted on it that she was a great deal improved. I did not find a single case in which I thought there was the slightest benefit, except in the hemorrhagic condition of the intrauterine type. This history shows a direct effect of the mind, of the patient's nervous system, on the up-to-date cure. I wish you would consider this in reference to the effect of radium treatment. It was almost exactly the same in its application with that of Apostoli. He has been forgotten, except in an historical sense. We are placing too much importance on the application of radium. I have sent a number of patients to experts without benefit. I have had serious criticisms on the results. I do believe that while radium is still in the experimental state we must not expect too much from its results. Fortunately, its high cost tends to keep it in the hands of only a few experts. It must be used with care.

Dr. Frederick J. Taussig, St. Louis: In fibroids of the uterus we can establish a routine that is in contradistinction to what I said as to the treatment of cancer. I think the treatment of fibroids of the uterus with radium can very well be extended to any person qualified to make a gynecologic diagnosis. As to myomectomy, I quite agree with Drs. Ward and Mayo regarding its value in younger persons. Yet, let me call your attention to the figures in my tables showing that in those cases that were suitable for radium, in other words, fibroids that were within the pelvis, in white women, the age incidence was 42½ years. In other words, there are relatively very few of these cases in which we can seriously consider an operation for the preservation of the function of conception. As to the incidence of thrombophlebitis, I have spoken with a number of my colleagues from the South, and their general impression is the same as mine, namely, that the incidence of thrombophlebitis among colored people is relatively very low. However, I trust that further information will come when more extensive statistics are available.

THE TREATMENT OF THE TOXEMIA OF EARLY AND LATE PREGNANCY

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This paper deals only with the treatment of the toxemia of pregnancy, reference being made to the etiology in order to explain reasons for choosing a given method of treatment.

There are two methods of managing these cases: One is to treat symptoms as they arise; the other is to base treatment on the pathology of the condition. I believe the latter to be the better method, while giving due regard to symptoms, and conserving the patient's strength and preventing suffering.

A majority of opinion would acknowledge the essential element in the toxemia of early and late pregnancy to be the presence, in the blood of the mother, of poisons which alter the blood tension and predispose to the formation of minute emboli and thrombi. The symptoms produced by this condition will depend on the virulence of the poisons and the pathologic and anatomic peculiarities of each patient. In early pregnancy, the embryo has much to do with this condition through the rapid growth of the chorion and syncytium, and the free discharge of their cells into the blood stream of the mother. Immunizing substances in her blood are overburdened, for the time being overpowered, by this process. After the formation of the placenta, the conditions are different and the pathologic picture is drawn in the placental tissues, and in the vital organs of the mother.

In early pregnancy, we recognize that the diseased condition affects the metabolism of the patient because

of the immediate disturbance of all the processes of nutrition. The nervous phenomena of the toxemia of early pregnancy are those which invariably follow a profound disturbance of digestion and assimilation. Thus, when nephritis in the nonpregnant checks assimilation and excretion, there occur the nausea, vomiting and prostration characteristic of the toxemia of early pregnancy. In some diseases of the liver, when there is no pregnancy, the symptoms are those of toxemia in the pregnant woman.

TREATMENT OF TOXEMIA OF EARLY PREGNANCY

So far as the treatment of the toxemia of early pregnancy is concerned, it cannot be intelligently conducted unless it is based on the altered condition of the patient's nutrition. Second in importance is the disordered state of the nervous system. If it can be recognized that any one of the processes essential to assimilation is at fault and this can be corrected, obviously the condition can be controlled. Thus, if the pregnant patient is suffering from deficient action of the thyroid gland, the administration of thyroid extract in some suitable form is indicated. If persistent disturbance of blood pressure called attention to the deficient action of the suprarenals, the administration of epinephrin would be appropriate. If conditions were present which are seen in the lack of action of the pituitary body, this substance might be used; but unless it can be demonstrated that some one of these is the predominant factor in the patient's condition, the most rational treatment consists in putting the nervous system at rest, so far as we can, and endeavoring to reinforce the immunizing principles in the patient's blood.

The problem of putting the nervous system at rest is often complex and difficult. Freedom from physical disturbance and freedom from mental disturbance are equally important. Trained nursing is exceedingly

valuable, not only for the care of the patient, but because the records of the trained nurse furnish the physician material of the greatest importance in estimating whether the patient is gaining or losing. The discipline and facilities in hospital are urgently needed in these cases.

To make these statements more specific, the patient in hospital and in bed should first be deprived of food given by the stomach. A twenty-four hour specimen of urine should be examined by nitrogen partition, the blood urea taken, the pulse tension and examination of the blood made for anemia, and pulse and temperature recorded. Copious lavage of the stomach with warm sodium bicarbonate solution should be given from one to three times in twenty-four hours until vomiting ceases. The intestines should be gently but thoroughly irrigated once or twice in twenty-four hours with warm solution of sodium bicarbonate. The patient's skin should be cleansed with soap and warm water and she should be kept between blankets or thin woolen. Five per cent. glucose and 5 per cent. sodium bicarbonate should be given by bowel, from 4 to 6 ounces, at intervals of from four to six hours. The patient may have as much water as she will drink, without ice, and any form of aerated or saline water acceptable may be used.

These simple measures will often induce sleep and rest. If they do not, codein in half-grain doses may be given hypodermically, sufficiently often to soothe and sustain the nervous system. The quantity of urine passed each twenty-four hours should be measured and recorded, and an accurate record kept of all that happens to the patient. The visits of friends and relatives must be forbidden, and only the husband of the patient should see her for the first few days.

In from thirty-six to forty-eight hours, the violence of the toxemic attack will somewhat abate. Local symptoms, as neuralgic pain, may be relieved by mild

counterirritation, and, as soon as vomiting ceases, the effort should be made to nourish the patient. Fruit albumin and strained gruel are best in the beginning. As little as a half ounce is often sufficient at one time, and the interval of feeding may be varied with the behavior of the patient. A vaginal examination should be made to determine the condition of the pelvic organs, and if there is retroversion of the uterus, this must be corrected. It is well to avoid the use of pessaries, if possible, and to retain the uterus in proper position by the assumption of the knee-chest posture. Should anesthesia be necessary for replacement, ether and oxygen are best.

INDICATIONS OF IMPROVEMENT

The interesting question arises: How can the physician know that his patient, in the meantime, is not distinctly losing ground? The toxemia of early pregnancy is usually accompanied by low pulse tension; therefore, a gradual rise in pulse tension is an indication of improvement. The temperature is usually subnormal in these cases, and a rise to normal would naturally be a favorable indication. A rapid and feeble pulse would, if the patient gained, be slower and stronger. The power to sleep naturally, instead of remaining wakeful or lying in a stupor, would be an evidence of improvement. The development of hunger would also be a favorable symptom.

But more accurate than these are the laboratory and microscopic findings. The nitrogen partition of the urine would show increased urea and diminished poisonous products, as would the blood urea. Microscopic study of the blood would show that the red cells were not broken down extensively and that the blood picture was becoming more normal. The quantity of urine would increase, and the condition of the patient's skin be more nearly normal. If there was vomiting at all, it would be of brief duration, occurring in the early morning and not returning during the day.

UNFAVORABLE INDICATIONS

On the contrary, if there was no improvement in the nitrogen metabolism, in pulse tension, in blood urea, in the ability to sleep or take food, in the temperature, or in the general condition of the patient, she would obviously be losing. Too much stress cannot be laid on the point that, unless a patient yields promptly to the treatment described, she may readily pass into a condition of extreme danger. Accurate and minute daily records, with repeated laboratory examinations, are necessary if this danger is to be avoided. As soon as the physician is satisfied that no progress is being made and that the patient is slowly losing, pregnancy must be interrupted at once.

NECESSITY FOR CONSULTATION

It has been customary to consider a consultation absolutely necessary before so important a step as this is taken: but it must be remembered that only an obstetrician is competent to recognize the essential points of such a case, and that there is no safe method of knowing whether the patient is gaining or losing if she is not under accurate observation, as indicated. Furthermore, in consultation there may always be the minority report of the physician who is not familiar with the pathology of the condition, and so may be deceived by a slight and temporary improvement in the patient's feelings, although pathologic findings indicate increased danger. It is safer to trust to accurate observation and an accurately obtained record than to trust the judgment of several physicians who may differ in their interpretation of symptoms.

CASES OF FULMINANT TOXEMIA

In cases of fulminant toxemia of early pregnancy, the patient, if possible, should be immediately taken to the hospital. The most vigorous treatment to secure prompt elimination is necessary. Whether pulse tension is high or low, bleeding, followed by intravenous

saline transfusion, copious lavage of the stomach and intestine, rousing the action of the skin by dry heat and hypodermic medication to sustain the action of the heart, are all indicated. Unless a prompt improvement follows such treatment, pregnancy must be terminated as soon as possible.

The prognosis for future health for a woman who has once passed through an attack of the toxemia of early pregnancy is not always favorable. Recovery may apparently follow, but later in life the patient may develop nephritis or some other chronic toxic state whose origin can be traced back to a pregnancy. Patients who have the toxemia of early pregnancy should be kept under observation for at least a year after the termination of the pregnancy. Repeated examinations of the urine, and of the blood, and the taking of blood pressure are indicated. In more than one instance a chronic nephritis can be traced to a toxemia of early gestation.

GRADUAL DEVELOPMENT OF TOXEMIA

The prevention of the toxemia of early pregnancy may be difficult because its development is gradual and insidious. The nausea of pregnancy is so often considered an inevitable accompaniment of gestation that the importance of nausea and vomiting in the pregnant woman may not be appreciated. Nothing but the invariable rule that all pregnant patients require observation, and that each should be seen at regular intervals by a physician competent to care for her, can protect the patient against this complication. Each case must be considered on its own merits. Peculiarities of gestation and assimilation, and of the nervous system, and the conditions of life peculiar to each patient must be studied and appreciated.

TOXEMIA OF LATE PREGNANCY

The toxemia of late pregnancy is usually supposed to occur after the formation of the placenta and at least the period of viability. It may or may not be accom-

panied by convulsions. When these are absent, acute pain in the epigastrium, nausea and vomiting, violent headache, and sometimes disturbance of vision may precede convulsions. In this condition the presence of the fetus may become a complication, if there be a strong desire on the part of the mother to obtain a living child. Sometimes fear that a method of treatment may injure the child is an obstacle in the management of these cases. On the other hand, the statement that treatment will protect the child may assist greatly.

These are emphatically cases for hospital care. Symptoms of toxemia should be recognized, if possible, and alarm be taken before the convulsions begin. On admission to the hospital, unless there is some unusual complication, bleeding and transfusion should immediately be done. Anesthesia is to be avoided, and local anesthesia can readily be employed before opening a vein. This should be followed by irrigation of the stomach and the leaving in the stomach of from 1 to 2½ grains of calomel, with sodium bicarbonate. The bowels should be thoroughly irrigated with hot sodium bicarbonate solution. The patient should be catheterized, and the urine examined. The blood obtained should be examined for blood urea, and a record kept of the findings and of the quantity of urine obtained by catheter. It is well to place the patient between blankets and, if the skin does not act promptly, dry heat may be introduced beneath the blankets. Wet packs should be avoided, as they are depressing and tend to produce pulmonary edema.

The question of the employment of narcotics will at once arise. Their use will depend on the degree of nervous irritation present, and also on the extent to which the patient is unconscious. It is well to begin eliminative treatment first, for very often it will act as a sedative. If, however, there is evidence that the nervous system is suffering from the condition, then morphin, hypodermically, is indicated. If there is a tendency to bronchial catarrh, atropin also should be

given, and, if the action of the heart is greatly disturbed, digitalin may be added.

A vaginal examination is unnecessary at first, and is far less important than the treatment to secure elimination. When, however, this has been given, such examination should be made, the condition of the cervix being noted, and also the presentation and the position.

INDICATIONS FOR EMPTYING THE UTERUS

The old discussion as to whether these patients should be treated by the immediate emptying of the uterus still prevails. I do not believe that the immediate emptying of the uterus is indicated. Such a procedure does not invariably cause convulsions to cease, nor does it in the severest cases and in many others materially improve the condition of the patient. There can be no question that labor is an irritation and may increase convulsions, and if the patient is in labor and labor is developing naturally, it should be expedited in the manner which will cause least disturbance and traumatism to the patient. In multiparous women, if the cervix is partially softened and dilated, the membranes may be ruptured. Labor will then proceed more actively, probably accompanied by the development of an increase in convulsions.

There is one exception to be made to the statement that the emptying of the uterus is not indicated in the toxemia of late pregnancy. When, in a primipara, the fetus is in good condition, the cervix unshortened, unsoftened, undilated, convulsions appearing or threatening, and the whole condition has arisen suddenly, immediate delivery by abdominal cesarean section is indicated, provided the fetus is at least viable, and preferably near term.

EFFECT OF CONVULSIONS

Another point of importance is the question of the necessity for absolutely preventing or limiting convulsions. If the convulsions were the important element in

the case, then a patient who had the greatest number of convulsions would be most liable to die; but accurate and extensive observation shows that this is not true. A woman may die in the toxemia of late pregnancy without a convulsion, and others may survive from fifty to a hundred. Convulsions sometimes produce a favorable effect on the case; for they are followed by increased secretion, action of the skin and sometimes of the bowels, and in some cases the development of labor during convulsions seems to have favorable influence.

ELIMINATIVE TREATMENT

Four hours after the first eliminative treatment is given, intestinal irrigation should be repeated, and glucose and sodium bicarbonate solution should be left within the bowel for absorption. If there has been vomiting, the stomach should again be irrigated and magnesium sulphate in solution left within. The general condition of the patient as regards excitability and the state of the circulation should be observed, and such medication given hypodermically as seems indicated.

Under such treatment the patient will grow better or worse. The occurrence of labor is also a third possibility. If the patient grows better, the bowels will act freely, the secretion of urine will be increased, and the blood pressure will become less, if it has been excessive, and will become greater if it has been deficient. The disturbance of the nervous system will subside and the patient will usually complain of thirst and sometimes of hunger. Milk and water, equal parts, may be given in small quantities as often as the patient will take it. The use of blankets, to promote the action of the skin, and irrigation of the intestine should be continued, the intervals of intestinal irrigation being gradually lengthened. No solid food should be given until the organs of elimination have acted thoroughly and the patient's general condition indicates the ability to digest food.

POST PARTUM TOXEMIA

Post partum toxemia in late pregnancy requires the same treatment given to a patient before labor. Symptoms are usually less severe and the percentage of recovery greater.

Because the fetus shares in the pathologic condition of the mother, no risk should be thrown against the life of the mother for the sake of the child, nor, on the other hand, should the child's life be deliberately sacrificed to save the mother. Fortunately, what is best for the mother is best for the child; that is, thorough treatment of the toxemia by elimination.

Experience has taught me to avoid anesthetics for the control of convulsions: also hot, wet packs, depressing drugs, rapid emptying of the uterus by rapid dilatation of the cervix and forceps or version, and attempts to save the fetus at the expense of the mother. Experience has also taught me the value of bleeding, followed by transfusion, done, if necessary, under local anesthesia; copious irrigation of the stomach followed by calomel or saline; copious and repeated lavage of the intestine; dry heat; and morphin as needed to control excessive irritability of the nervous system. Labor should be aided when in progress; in exceptional cases prompt delivery should be made by abdominal cesarean section.

Patients passing through the toxemia of pregnancy after delivery are in danger of acute mental disturbance in the form of mania. They are in danger of pulmonary edema also, with minute embolism and thrombosis of the pulmonary capillaries. For mania, restraint and sedatives are indicated, after eliminative treatment has been given. For edema of the lungs, dry cups in abundance, strychnin, digitalin and atropin, hypodermically, a limited quantity of glucose, sodium bicarbonate by bowel, or, if the patient can swallow, milk and water by mouth. The inhalation of oxygen is sometimes useful. In dealing with all toxemic patients, fresh air is demanded and oxygen is valuable.

I know of no way by which one can accurately give a prognosis in such a case. A positive statement that recovery or death will occur should be withheld for at least two weeks after the termination of the attack of toxemia. During this time pulmonary complications may develop, which may prove fatal. A similar precaution should be taken regarding the child, if it is born living. It may develop within two weeks an acute toxemia which may quickly end its life.

CONCLUSIONS

Statistics regarding recovery from the toxemia of pregnancy, whether early or late, are misleading. No one can accurately estimate the resisting power of the patient or the virulence of the toxins. When symptoms have subsided and the patient is apparently safe, complications may develop which may end life. Under any reasonable method of treatment, a series of cases can be conducted with a low mortality, followed by a group of cases in which no method of treatment is of much value and where the mortality becomes excessively high. Practically speaking, the most important points concerning the subject are the familiar facts that pregnant patients require special care; that the toxemia of pregnancy, early or late, is serious, demanding hospital service; that in a well appointed hospital, prompt and efficient treatment can be given, guided by clinical observation and laboratory examinations, and that the mother's chance for recovery depends on early diagnosis, prompt and thorough treatment, and the avoidance of whatever may be depressing to the vital forces.

ABSTRACT OF DISCUSSION

DR. GORDON G. COPELAND, Toronto, Canada: I have seen several cases of toxemia coming on within the first two months of pregnancy in which vomiting was excessive and sedative treatment failed. Two cases ran a very fulminating course. One woman, whose uterus was emptied at two months six or seven years ago, went through a successful pregnancy subsequently. She then had influenza. She became

pregnant the second time. The second day after I saw her she started vomiting. As she had acetone and diacetic acid in large quantities in the urine, and as stopping all food by mouth and giving morphin and bromids did not control the vomiting, we decided that the best thing to do was to empty the uterus. She was slightly jaundiced. We gave her gas and oxygen and emptied the uterus in fifteen minutes. The patient failed rapidly and died two days afterward. The duration of this fulminating case was only five days. Another case of fulminating toxemia occurring in pregnancy terminated fatally. I saw the patient when she was moribund. I have found that in these desperate cases intravenous or intermuscular injection of corpus luteum, or a 10 per cent. glucose solution under the breast, is of great value.

I would take some exception to Dr. Davis' statement that the operative treatment, or the more radical treatment of convulsions, is not quite as good as more conservative treatment. Among fifty-three consecutive cases, the mortality has been 3.7 per cent. The point I would like to bring out is to treat the individual patient and not to follow routine treatment. If the uterus is easily dilatable, and if the woman can be delivered readily without trauma or injury, and with a minimum of anesthetic, I believe that the patient would do very much better and would have a chance to get a living baby which is not subjected to further toxemia. To let these women go on indefinitely under conservative treatment will frequently place them beyond all hope of getting a living baby. Some day we will want conservative treatment, but in the majority of cases, the rapid emptying of the uterus without trauma and without adding further unnecessary injury is the preferable treatment.

DR. W. M. BROWN, Rochester, N. Y.: I wish to emphasize the great value of careful routine pathologic study of each case rather than to depend on the consultant who sees the case in an emergency. One point not mentioned in the pathologic study is the value of knowing the creatinin content of the blood, as indicative of the ultimate renal efficiency, which may be a very determining factor. We carried along a patient for two or three weeks with apparently great improvement in her condition and yet there was a constant and steady rise in the creatinin content. The patient got along all right after the uterus was emptied. The use of corpus luteum extracts is empiric. I have had one or two cases in which the use of these extracts was attended by apparent success, and I have had a great many cases in which there has been apparently no result. Another point to be considered is the value of the child's life. With the patient in the latter months of pregnancy, and a viable child, I used to feel that the baby has a better chance outside than inside. The baby is going to be killed by the toxemia. If

we get it out without too much shock, it would seem we are increasing its chance to live. However, I have seen many of these babies born at that immediate time under a great deal of stress and strain. They were toxic when born. Can we treat them better intra-uterine if we are more conservative with the mother and rid her of her protein overload? Will she do better for that baby than we can extra-uterine? I am hesitaing more now about bringing on labor too quickly in these toxic cases. A profoundly toxic woman is not a good surgical risk. The conditions must be almost ideal before I advise cesarean section in these cases.

DR. CARL B. DAVIS, Milwaukee: Dr. Davis referred to the use of codein. In my experience with the toxemias of early pregnancy, opiates have tended to increase vomiting, and I believe that for the most part they are contraindicated. Sodium bromid in large doses will control the nervousness to which Dr. Davis has referred without increasing the nausea. With glucose and soda solution given by rectum, I give at first 1 gm. sodium bromid with each retention enema. Nothing is given by mouth for twenty-four hours or longer. When the patient comes under the effects of the bromid, her nervous symptoms are controlled, and usually the vomiting stops. Later on, the effervescent triple bromid is administered by mouth to control the nervous irritability. The point of putting the patient in a quiet dark room, away from all disturbance, is very well taken. Dr. Davis did not mention the use of intravenous glucose solution. It is believed that when the patient does not respond readily to the use of glucose, soda and bromid by rectum, the slow administration of a 20 or 25 per cent. glucose solution intravenously will obviate the necessity of terminating the pregnancy in most instances. It is my impression at present that in the uncomplicated cases the nausea can be controlled without termination of pregnancy. If the patient has a severe myocarditis or diabetes, the termination of the pregnancy probably will not save her. The alkali reserve is a better index to the condition of the patient than the tests to which Dr. Davis referred. When the alkali reserve goes as low as 30, the probabilities are that the child will die, and in spite of treatment, the patient will abort. After the nausea is controlled, the use of a dry diet, high in carbohydrates and very low in fat and protein, is indicated until the patient has passed beyond the period of nausea. If it becomes necessary to empty the uterus, morphin-scopolamin anesthesia may be use.

DR. EDWARD P. DAVIS, Philadelphia: From a considerable experience I have selected those measures which in my hands are of proved value. In early pregnancy and in all toxemic cases, I would warn against the use of nitrous oxid as an anesthetic. In my observation it has proved rapidly fatal in some cases in which it was used to interrupt pregnancy.

The surgeon did not get to operate because the patient died under the anesthesia. In cases of toxemia nitrogen is a doubtful substance to employ by inhalation, even in the form of gas. The case described by Dr. Copeland was one of profound liver toxemia, which is often fatal. I agree with him that corpus luteum will not always be of value. I recall my experience when a colleague asked me to test pituitary extract as a galactagogue. I selected ten healthy primiparas and gave pituitary extract by hypodermic injection. The result was good. I then selected ten others. I told them I had a foreign substance which must be given hypodermically so as not to waste a drop. I gave them sterile water. The result was greater even than with pituitary extract.

When nature wishes to empty the uterus, she should be aided; but I do not believe in rapid emptying of the uterus unless nature does indicate her desire to empty the uterus. I have seen women pass through eclampsia, go on for three or four weeks afterward and give birth to a living child. If such a uterus had been subjected to rapid emptying, what would have happened to the mother or child? As to the creatinin content of the blood, I recognize the value of this examination. I have yet to see evidence that codein is bad for toxic women. I recognize the value of sodium bromid, and at times use sodium bromid by injection. The alkali reserve is an interesting problem. I trust we may soon resort to metabolism determinations in these cases. Anesthesia by hypodermic injection is always useful, but in most cases ether and oxygen is safest because the toxic woman has a bad heart and ether stimulates heart action. When you see a woman with high blood pressure, urine loaded with albumin and casts, have her eyes examined as soon as possible. I would urge also the value of spinal puncture and the withdrawal of spinal fluid to save vision.

THE TREATMENT OF INFECTED ABDOMINAL WOUNDS BY THE CLOSED METHOD

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CHICAGO

Some time ago obstetricians, notably Williams, demonstrated that physiologic sodium chlorid solution was preferable to solutions of mercuric chlorid for intra-uterine irrigation in case of puerperal infection. The significance of this observation proved not the relative value of the salts but that antiseptic irrigation of infected wounds was harmful. It was later found that all irrigation of wounds was injurious. This knowledge has become so generally disseminated that douches in puerperal infections have become obsolete in modern obstetrics. These findings were later corroborated by research investigations using control cases, which proved that the use of antiseptics in infected wounds injured and delayed repair; that antiseptics injured the tissues more than the bacteria. It is not necessary to go into a detailed description of this here.

An early study of the acute cases of infection of the fallopian tubes demonstrated that the pus became sterile. Extensive and valuable research corroborated this observation and determined much knowledge of infection and immunity. There seems to be general appreciation of the modern ideas of infection and immunity relative to infections of the various organs of the body, and the treatment has been much modified accordingly. This modification of treatment has not so well extended to the treatment of infected wounds.

The problems involved in the treatment of infected organs and in infected wounds are nearly identical; for

example, in cases of acute infection of the fallopian tubes and in cases of infected abdominal wounds, little or no local improvement occurs while fever and leukocytosis exist. When the fever and leukocytosis disappear, which means acquired general immunity, recovery of the local lesion is rapid. There is no more reason for radical treatment of infected wounds than for the radical treatment of acute salpingitis; in fact, there is less danger from the wounds than from the tube, because in the case of the wounds suppuration extends along the line of incision, while in the tube the suppuration extends along the path of least resistance. Traumatic interference disseminates the infection, disturbs the local reaction, delays immunity and repair, and unnecessarily distresses the patient in both cases.

Presence of pus is not so important as was formerly considered. Some infections that do not suppurate are more serious than some in which suppuration takes place. The pus often becomes sterile. The presence of pus produces an autovaccination—a delight to devotees of vaccines, if not of much value to the patient.

Observation of the treatment of infected wounds often suggests a confusion of cause and effect, the pus instead of infection being mistaken for the disease. The disease is infection; pus, the result of infection. Infected wounds continue to be overtreated as a result of tradition, certainly not as a result of accrued accomplishments in the study of infection and immunity.

TREATMENT

The treatment, not original, which I am advocating for infection of abdominal wounds is the "closed method:"

1. No sutures are removed until the wound is healed.
2. No drainage material is inserted.
3. No probing or manipulation of the wound is permitted.
4. Moist dressings are kept continuously over the wound as long as it remains reddened or indurated, care being taken not to macerate the tissues excessively.

The moist dressings accomplish efficient drainage. A large amount of drainage will take place through small openings if the discharge is not permitted to desiccate and close the openings. Proof of efficient drainage can be obtained by turning the patient so as to test the drainage by gravity. Drainage occurs through small gapings at the edge of the wound and at times along the sutures. No exception to this treatment is made when intestinal fistulas or sinuses are present. There is no danger of premature closure of the wound at the surface. It is impossible to obtain permanent closure as long as a foreign body remains, which is the condition present in case of fistulas and sinuses.

RESULTS

I have observed the results of this treatment for some fifteen years. The technic of the treatment is practically the same as was given by me in a paper read in 1907 before the Chicago Medical Society.[1] I have had opportunity to compare the results of the treatment of infected abdominal wounds by the open and closed methods. For some years it had been my custom to remove sutures, establish drainage and actively treat infected wounds as soon as the presence of pus was suspected. The results of the closed method have materially shortened the time required for complete healing of the wound. With the closed method the wound is almost invariably completely closed at the end of two or three weeks from the time of operation. This saving of time results because, when suppuration ceases with the closed method, no wound remains to be closed by granulation or secondary suture. It has been a matter of considerable surprise that the febrile disturbances have seemed to be about the same with the closed and open methods of treatment. An important feature of the closed method is the slight disturbance

1. Watkins, T. J.: Illinois M. J., September, 1907.

of the patient, as the treatment occasions no pain, and assurance can be given that the suppuration is of minor importance.

HERNIA

The most important observation has been the absence of hernia with the closed method of treatment. We have been much surprised at the strong abdominal wounds which we have observed in cases of infected wounds treated by the closed method. In the follow-up work which we have carried on in our office and at St. Luke's Hospital, we have encountered no hernias. The experience has been very different in cases treated by the open method, as in these it is exceptional not to find a hernia. The absence of hernias following the "closed method" cannot be attributed to excellence of closure, as we occasionally have the misfortune to have hernias in cases that do not suppurate. The inference is that suppuration diminishes the danger of hernias when the wound is treated by the closed method. If the fascia remains in apposition, infection increases the amount of connective tissue formation and consequently strengthens the union of the wound. We have rather actively pursued this question of possible hernias from infected wounds treated by the "closed method," as the results seem to be too good to be true; but have been unable to find any hernias.

SCARS

The scars that result seldom indicate that the wounds have suppurated.

The increased length of time which patients with infected abdominal wounds have been required to stay in the hospital when treated by the closed method is seldom more than one week.

REPORT OF CASES

CASE 1.—Mrs. F. W., infected cancer of the cervix. Fever for seven days, 100 to 101.8. Suppuration appeared on the ninth day. Wet dressings continued three days. Drainage profuse, purulent and offensive. Sutures removed on the thirteenth day. Patient discharged on the twentieth day. Subsequent tests showed strong abdominal wall.

CASE 2.—H. F. L. Extensively infected cancer of the cervix. Fever for nine days, 100.4 to 102. Suppuration appeared on the tenth day. Discharge profuse, purulent and offensive, for three days; disappeared on the seventeenth day; sutures removed on twentieth day. Severe case complicated by ureteral fistula. A strong wound resulted. Time in hospital, four weeks. Kidney was removed later on account of ureterovaginal fistula.

CASE 3.—Mrs. A. W. Treated in another service. Tuboovarian abscess; wound closed without drainage. Suppuration detected on fifth day, when sutures were removed and drain inserted at lower angle of wound. Active treatment of wound until fifteenth postoperative day, when wound was curetted and closed by secondary suture. Wound healed on forty-third day. Large hernia resulted.

Seven months later, patient admitted to service of my colleague, Dr. A. H. Curtis. Sixth postoperative day, temperature 102, slight discharge; moist dressings applied. Tenth day, fever absent, drainage free; twentieth day, wound healed with only superficial serous discharge. Photograph after second operation shows no hernia. Strong abdominal wall.

Time required for complete healing was only slightly longer than usual as wound was practically healed on the twentieth postoperative day, but patient was not permitted to go home until we were sure there would be no stretching of the wound edges. Interesting features are hernia followed the open method of treatment, and a strong wall was obtained with the closed method. Wound healed twenty-three days sooner with "closed" than with "open" method.

Hernia followed open treatment. Hysterectomy for fibroid. Third day sutures removed and drainage instituted. Sixth day after suppuration of edges of wound. Seventh day wound opened entire length; eighth day secondary sutures of silkworm-gut. Following this the wound was actively treated with Dakin's tubes, irrigation and again sutured. Forty-seventh day pyelitis developed. Sixtieth day was transferred to our service. All active treatment stopped, drainage tubes removed and boric acid dressings applied. Wound healed, leaving a large hernia. This may be an extreme case of slow closure with the open method but it is illustrative. From the experience we have had with other wounds we believe this wound would have completely healed in three weeks by the closed method.

104 South Michigan Avenue.

ABSTRACT OF DISCUSSION

DR. RICHARD R. SMITH, Grand Rapids, Mich.: For many years I have followed this closed method of treatment of infected abdominal wounds. It has a distinct advantage over the older method of treatment of removing stitches, freely

opening the abdominal wound, and allowing it to heal by granulation. By the closed method of treatment normal convalescence is not distinctly prolonged, the healing of the wound is distinctly shortened, and the ordeal of daily dressings is largely eliminated. However, I have made certain exceptions to this plan of treatment. In cases that do not do well under it, it has been my habit, after giving this method a fair trial, to remove one or two stitches, as few as possible, open up the wound partially, and procure drainage. I do this for two purposes: (1) to prevent a sloughing of the fascia, and (2) to prevent the burrowing of pus along the fascial planes or along the natural lines of cleavage of the abdominal wall. These may otherwise occur in cases in which the bacteria are of such a nature that they cannot be controlled properly by the patient, and in those patients who are in such a plight that their healing power is markedly diminished. Hernias of the abdominal wound, incisional hernias, are after all but partial ruptures of the abdominal wound which have occurred early in the postoperative course, that is, within the first ten days, due to straining, coughing or vomiting. The fascia of the abdominal wall gives way, and there is laid the foundation for the hernia which appears later. There are one or two exceptions. In the first place, the opening up of suppurating wounds, which is avoided by the closed method, is one of the reasons why we have these hernias. And secondly, it may be due to a pronounced sloughing of the fascia, which we avoid in the occasional case just mentioned by draining the wound.

DR. CHARLES T. SOUTHER, Cincinnati: I thoroughly agree with Dr. Watkins. The importance of not opening up these wounds is certainly evident from the results we get in treating cases by the closed method. The danger to the patient from absorption of the fluids and pus accumulating in these wounds is from the supernatant liquid and not from the pus cells themselves. The watery element will escape through an extremely small place, as Dr. Watkins has said. Two years ago I presented the ointment treatment of wounds. This method is exactly analogous to the wet treatment presented by Dr. Watkins. If the wound is not allowed to dry and the pus discharge is not allowed to dessicate, the wound is not sealed up at any time, so that we get a continuous drainage of the supernatant liquid, and this is the only element in the pus which is dangerous, because it has to become absolutely fluid before it can be absorbed. My practice in these cases is to put in interrupted stitches, an inch apart, sufficiently far apart to draw the fat layers together, and in that way there is drainage between the sutures of all the exudate that occurs in the wound postoperatively for the first twenty-four hours. After that there is usually no accumulation, except that which is more or less septic or hemorrhagic in character. If it is hemorrhagic, it will

usually find exit through the point of least resistance, which is between the sutures. I do not close the intervening space with clips, except in rare cases, and almost never in the lower abdominal incision. By suturing wounds without drainage and putting on an ointment dressing, I have not had an infection in five years. Necrosis occurs as the result of the primary injury. By keeping the ointment dressing on in preference to a wet one, these patients never get too cold in going about in winter as ambulatory cases.

DR. HUGO EHRENFEST, St. Louis: The difference between the open method and the so-called closed method is not so great as it would seem. It seems that, as a rule, the surgeon believing in the open method, as soon as he has opened the wound widely, draws it together again with adhesive strips. I maintain that I save myself the trouble of bringing the edges together again by preserving broad skin bridges.

DR. GEORGE ERETY SHOEMAKER, Philadelphia: Those who have tried Dr. Watkins' method will find value in it. Of course, there are severe cases in which other methods must be used. The worst infected abdominal wounds which I have had to deal with have been those in which my suspicion was not aroused early enough to lead to a dressing, or in which the resident physician had dressed the wound and had in excess of zeal removed all the sutures and left the wound open. Healing is then a long process. Suspicion is aroused by a continuing temperature elevation in the first four or five or six days, and we are suspicious of what is underneath the apparently healed skin, remove one stitch, make a culture, and with the greatest gentleness let out any fluid present and then apply a wet dressing. I like a few drops of tincture of iodin in a watery solution. When I do that myself I do not get those gapping wounds with the slow healing in which it is necessary to sterilize with surgical solution of chlorinated soda and resuture. Nearly every wound can be saved in this character of infection by this wet dressing method and early drainage.

DR. W. M. BROWN, Rochester, N. Y.: Dr. Watkins said that no drainage material was used; no sutures are removed at all. It takes a lot of courage to open an appendix abscess and close it without drainage. In fact, I doubt the wisdom of that. When I spoke to Dr. Watkins, he said he did put in a soft cigaret drain temporarily. Over thirty years ago I operated on my first pus appendix. I put in three heavy rubber drainage tubes and sewed it up with silver wire, and in spite of the rubber tubes no hernia followed. I have attended this woman in six confinements since then, and she has no abdominal hernia after leaving those three heavy drainage tubes in for three or four weeks. I have in mind a recent case in which there was a postpartum tube infection with a large exudate; and after watching it for more than

a month and being convinced that an operation was imperative, I operated and after liberating the adhesions and getting out the tube, I found in the lower portion of the sigmoid an area of about 5 cm. that was gangrenous with a small white area in the center. It was perfectly evident it was going to be a fecal fistula. I put a soft drain in and removed it at the end of thirty-six hours. About forty-eight hours afterward a small amount of fecal drainage came through. The woman is doing well. It seems as though this was a case that must have some drainage.

DR. THOMAS J. WATKINS, Chicago: I am inclined to believe that the danger of burrowing pus is feared more than is justified. I can appreciate that the anatomy in some parts would make the burrowing of pus dangerous — for instance, infections in the hands. This has not occurred in my experience in the abdominal wall. I agree with Dr. Smith that many of the hernias are probably due to strain from coughing and vomiting, breaking of catgut or slipping of a knot. Dr. Shoemaker emphasized the important part of the treatment of these wounds; that is, to treat them gently. It does not make much difference what you do to these wounds as long as you do not traumatize them with your fingers, your hands or with antiseptics or remove sutures. In reply to Dr. Brown, when I stated that I did not insert drains, I meant I did not insert drains in the treatment of infected wounds. I sometimes insert drains when doing a primary operation. Then if we feel that there is assurance that suppuration is probable insert a cigaret drain and leave it until suppuration occurs or until we are satisfied that suppuration is not going to result.

SIMILARITY OF THE DEMANDS OF LOCAL ANESTHESIA AND THE PATIENT'S BEST INTERESTS

ROBERT EMMETT FARR, M.D.
MINNEAPOLIS

In a previous contribution [1] I have stated:

> The obligation of the surgeon to his patient demands a high standard of development along a variety of lines. Diagnosis, in all that this term implies, combined with judgment regarding when to employ surgical measures and what measures to employ, must always remain the cornerstones of surgical therapy, and their establishment presents the greatest difficulties with which the surgeon has to contend. Surgical mortality and, more especially, surgical morbidity, are maintained at a high level on account of wrong diagnoses, and consequent misdirected surgical treatment, more than from any other cause.

And yet there are factors aside from these considerations which demand more attention than is ordinarily given them. I refer especially to the psychic care of the patient and the physical care of his body, both general and local. The relation between the psychic factor and surgical treatment has in the past received too little attention. Too frequently surgical therapy has been applied on a mechanical basis, without proper appreciation of the fact that the human organism is a complex machine under the control of a nervous syste min individuals of greatly differing mentality. Even in the classes of cases in which the symptoms and visible pathology correspond in the relation of cause and effect, we have been prone to neglect the psychic factor—the element of fear. We have neglected the human touch which means so much to the

1. Farr, R. E.: M. Rec., to be published.

unfortunate individual who finds himself in need of surgical care. It is pleasing to note that there is a gradual awakening, on the part of surgeons and those who maintain hospitals, to the necessity of paying more attention to these features when patients present themselves for treatment.

Having been deeply interested for many years in this phase of medicine and through this interest largely having my attention focused on the anesthesia problem as one of the important considerations in relation to the surgical patient, I have been struck by the great similarity in the demands which the best interests of the patient make, and the demands which local anesthesia impose on the surgeon. With your permission, I will compare briefly a number of points in which similarity seems to exist.

The best interests of the patient demand that, from the moment of the first visit until he is discharged, the maximum of courtesy and kindness be accorded him in addition to his scientific care. A moderate amount of experience in the use of local anesthesia will demonstrate to the satisfaction of any one that, in order to bring a patient to the operating room in a state of proper tranquility, courtesy and kindness are demanded. While in the operating room, the patient's best interests demand that every effort be made to reduce the amount of physical and psychic injury to the lowest possible degree. While it is to be admitted that a certain amount of psychic trauma—the estimation of which it is difficult to make—may accompany the use of local anesthesia and operation on a conscious patient, this factor will become relatively less important as people become educated to the fact that operations can be painlessly performed without the loss of consciousness. That this is a fact has become apparent in districts in which the people have been so educated. The association in the lay mind of the necessity of painful sensations as an accompaniment of the per-

formance of a surgical operation, without loss of consciousness, has become so fixed that its eradication will be a slow process. The horrors of operations on conscious patients, which had for centuries been handed down before the advent of general anesthesia, still obtain to a certain extent in the minds of the laity. The short period during which local anesthesia has been employed, speaking comparatively, has not been sufficient to entirely wipe out this more or less natural fear. Even though we had succeeded in making all operations in which local anesthesia has been used painless, which unfortunately we have failed to do, a certain percentage of people would be more or less ignorant of this fact; and while success in procuring anesthesia when using the method is the most potent means of overcoming psychic incompatibility, the evolution must unfortunately be slow. Moreover, the fact that a large percentage of attempts at the use of the local method have been failures, retards to a marked degree the process of evolution which is going on in the human mind. The failure of the profession to realize the possibilities of local anesthesia and the pernicious effects resulting from its unsuccessful use have not served to disabuse the lay mind of many erroneous notions. Quite naturally, it requires but a small percentage of failures to offset the confidence and reassurance resulting from a fair measure of success. The writer believes that surgeons should be less persistent in their efforts to complete operations begun under local anesthesia, regardless of the amount of suffering caused, and more willing to change to general anesthesia, should the necessity arise, than is the custom at present. It is only fair to the patient that he be not compelled to suffer pain during the carrying out of a surgical procedure; and again, the fears of patients who undergo such ordeals must necessarily reflect discredit on the method. In this way the amount of psychic incompatibility which prospective patients will

exhibit is indirectly increased. Therefore, psychic incompatibility, perhaps the greatest factor militating against the patient's best interests when using local anesthesia, is dependent on conditions which may and will eventually be overcome. While it is undoubtedly true that psychic incompatibility is one of the important objections to the use of local anesthesia, this factor alone has been one of the most important reasons for the awakening of the profession and the focusing of its attention to the psychic side of the problem, and it is through the efforts of those who have given special thought to this subject that credit must go for this awakening.

Aside from psychic considerations, the patient's best interests demand a reduction of physical trauma, both general and local, to the lowest possible degree which is compatible with the carrying out of a surgical procedure. In addition it demands the conservation of the blood supply; the avoidance of sepsis and complications involving the vital organs, lungs, heart, kidneys, liver, etc., and demands a reduction to an irreducible minimum of the amount of suffering, both physical and mental, before, during and after operation.

Perhaps one of the most striking examples of conformity with the patient's best interests is the opportunity offered for bringing the patient to the operating room with an abundance or a superabundance of fluids in his body. In the poor risks, the opportunity offered by local anesthesia in this regard cannot be overestimated.

The most important phase in considering the patient's best interests is undoubtedly that which relates to safety. He is entitled to the maximum amount of safety compatible with the carrying out of his course of treatment. Compared with other anesthetics, local anesthesia admittedly furnishes the patient with a greater margin of safety from the anesthesia per se, and in a larger sense from complications indirectly

related to anesthesia. It also reduces the morbidity resulting from complications associated with the various general anesthetics.

A certain amount of physical trauma, both general and local—especially the latter—is necessary in all operations. The necessity, however, of bringing the patient who is being prepared for an operation by the local method to the operating room in a proper mental condition, in addition to the fact that the conscious individual will demand more gentleness on the part of the attendants, insures this class of cases the minimum of injury. Comfort on the operating table demanded by a conscious patient also serves to eliminate injuries such as joint dislocation, leg and back strain and sacro-iliac luxation.

Local trauma to the tissues should be reduced to the minimum, and local anesthesia demands this. Hemorrhage, which next to trauma is the most potent factor in producing shock, is more easily controlled under local than under general anesthesia, and is one of the important details in which local anesthesia allows one to conform to the patient's best interests.

In abdominal work, the best interests of the patient demand that the viscera be traumatized and handled as little as possible. The gauze pack, strong clamps, blind explorations and vigorous traction are incompatible with the patient's best interests, when they can be avoided. The use of local anesthesia in this work demands a correct diagnosis, a refined technic, a negative intra-abdominal pressure, allows the non-necessity of gauze packs and practically the elimination of anything but the mildest kind of traction. The patient's best interests demand that adherent masses be liberated by means of mild traction and the cutting of key bands with sharp instruments rather than enucleation by brute force. The use of local anesthesia demands and allows this procedure. The patient's best interests demand that a large part of the liver be not withdrawn from

the abdominal cavity when the gall tracts are being operated on, but rather that this organ be retracted and rotated upward beneath the costal margin. Local anesthesia demands and allows this procedure.

A careful following out of these precepts will be reflected in the postoperative patient by a relative absence of shock, depletion, nausea, vomiting, thirst, distention and gas pains, broken rest, unnecessary morbidity, and slow convalescence.

The best interests of the patient demand that localized intraperitoneal collections of pus remain localized during the transportation to the operating room and during the induction of anesthesia; that these collections be drained with the minimum amount of trauma and with the minimum opportunity for spreading the infection both during and subsequent to operation. Local anesthesia, in its broadest sense, demands such careful transportation of the patient to and from the operating room, such careful handling of tissues while in the operating room, such care in inducing anesthesia, and presents an opportunity, when the abdomen is opened, for lowering the possibility of contamination. I have personal knowledge of six cases of intraperitoneal abscesses which ruptured, spreading the localized infection, between the time the patient left the bed and the opening of the abdomen. The rough handling of these patients following operation, the vomiting which usually follows general anesthesia, the tossing about of the unconscious patient in the bed—all, with their potentialities for harm, form a distinct menace to the patient's best interests. Contrast this, if you will, with carrying the patient through the operation under the local method—the transportation to the operating room; the induction of anesthesia; the opening of the abdomen under a negative pressure: the careful introduction of gauze packs with the abdominal viscera in a placid condition—not forcing themselves into the infected field; the evacuation of the abscess;

the withdrawal of the packs; the careful conveyance of the conscious patient back to bed; the absence of vomiting, with its assurance that the viscera will maintain exactly the relation in which they were left, thus reducing to a minimum the opportunity for spreading of the intraperitoneal infection.

The patient's best interests demand that operating by the fractional method should receive more attention in the future than it has in the past. Too frequently multiple operations are performed at one sitting, which, had they been performed by the fractional method, would greatly have reduced the morbidity and the mortality as well. The work of Crile and Tinker on goiter illustrates this point with spectacular clarity, and the rule may be applied to surgery of other conditions with results which are not less striking.

While the application of the fractional method of operating is not incompatible with the use of general anesthesia, it finds in the use of the local method its most consistent ally. The tendency is still marked for surgeons to complete all of the work demanded in a given case once general narcosis has been established. The objections on the part of the patient to repeating the ordeal are partially responsible for this. With local anesthesia we have reverse condition, one of the main drawbacks to the use of local anesthesia being the fatigue of which the patient complains when the operative procedure is greatly prolonged. This fact makes it possible and even desirable to perform multiple operations by the fractional method. Here again the best interests of the patient and the demands of local anesthesia coincide.

Postoperative complications cost many lives and have a decided bearing upon morbidity. The patient's best interests demand that the lungs, heart, liver and kidney function be interfered with as little as possible. The use of local anesthesia comes nearer to fulfilling these demands than does any other.

It is assumed by the majority of surgeons that under local anesthesia exploration of the abdominal cavity cannot be carried out to any great extent with satisfaction. Assuming that this is true, one may well ask how this fact will affect the patient's best interests. Is a routine examination of all the abdominal viscera necessary, or desirable, when the abdomen has been opened for a specific purpose? Is not this procedure too often a subterfuge for an imperfect or an incomplete diagnosis? Cannot a pathologic condition of the pelvis usually be diagnosed by careful vaginal or rectal palpation, combined with the proper history; likewise, is it not possible to diagnose conditions in the upper abdomen with sufficient accuracy in the majority of instances by means of a well taken history, physical examination and properly coordinated laboratory data? While the amount of exploring that can be done under local anesthesia will depend largely on the ability and experience of the surgeon in the use of the method, a proper technic giving one an excellent chance to examine the placid organs in their normal habitat, it seems to me that the patient's best interests demand that the blind exploration be limited as much as possible. Local anesthesia demands a preoperative diagnosis, incision at the proper site, and of sufficient length to allow the carrying out of a surgical procedure with a minimum amount of trauma to the patient, an incision so placed that the affected organs may be brought in view without much traction or displacement. I wish to submit this question: Does not such a regimen coincide with the best interests of the patient? What lesions, for instance, may exist in the upper abdomen which can be accurately diagnosed by the exploring hand that cannot be fairly well anticipated by carrying out the approved diagnostic procedures? One might answer, "The presence of gallstones, which are silent, and have apparently never produced symptoms." In answer to this, I ask, "Do the patient's best interests

demand that an extra operation be performed on the gallbladder in such cases?" Almost the only organ about which doubt exists in every abdominal operation is the vermiform appendix, and the condition of this organ may be ascertained during the carrying out of a surgical procedure through an incision in either the upper or lower abdominal segments under local anesthesia, provided the proper technic is employed. The development of splanchnic and caudal anesthesia as an adjunct to blocking of the spinal nerves bids fair to make blind abdominal exploration possible in cases in which it seems necessary, although it would seem that the patient's best interests demand that these explorations to be curtailed as much as possible.

Even a cursory analysis of this subject will convince one that in almost every instance in which the patient's best interests are being conserved, the technic demanded and allowed by local anesthesia will be appropriate. The abolition of muscular reflexes; the allowance of a negative intra-abdominal pressure; the necessity for sharp dissection, for handling tissues with delicate instruments; a bacteriologic technic; elastic retraction with the avoidance of trauma, thus stretching the muscles rather than tearing them; perfect visualization which is made possible by the absence of expulsive effort; tilting o fthe operating table and a good light; the avoidance of the abdominal pack, excepting when used for the prevention of coiling; avoidance of traction and crushing of the viscera, of excessive haste with its necessary inaccuracies, and other factors almost without number are inseparably associated with the demands of local anesthesia technic, and coincide perfectly with the patient's best interests.

May I predict that the surgery of the future, which is sure to be an improvement on the surgery of the present, will show that these details are more keenly appreciated, and may I also predict that in the carrying out of these details the use of local anesthesia, or some

other form of anesthesia which makes it possible to conform to the best interests of the patient will come into more universal use?

ABSTRACT OF DISCUSSION

DR. CHARLES T. SOUTHER, Cincinnati: What Dr. Farr has presented seems to show that surgical work can almost be divided into two types, that which can be done under local anesthesia and that which can be done under general anesthesia. I have tried several times to produce local anesthesia for some of my colleagues. It has almost been the invariable experience that they make a long, deep incision with the first sweep of the scalpel. They follow this up with their usual ether technic of trying to cut with the back of the knife. Take up the tissues carefully. Cut with a sharp knife or sharp pair of scissors and do not, under any circumstances, try to tear tissues apart, because the patient is awake. It will shock him to a certain extent and prevent a nice, smooth, even anesthesia. We can do everything that Dr. Farr has done, provided we do it with the same degree of gentleness and with the same degree of expertness. We cannot do it as well as he does it until we have had something near the same experience.

DR. H. P. NEWMAN, San Diego, Calif.: There is still another point in relation to local anesthesia that should be considered, and that is the knowledge of the patient's consciousness and its effect on technic. Under complete anesthesia, with a degree of protection from hemorrhage, sepsis and shock, it is easy to forget that we are handling organs and living tissue, and we are apt to loiter over minor details. With the patient not only conscious but extremely alert to all that is being done in her behalf, prone to suggest and to dictate, there is every inducement to develop that delicacy, dexterity and expedition on which the success of the operation so largely depends. I would say then, that in properly selected cases local anesthesia has much to recommend it.

THE SURGICAL TREATMENT OF LESIONS IN THE INTERNAL GENITAL ORGANS

ASSOCIATED WITH CHRONIC INFECTIONS

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By the expression "lesions associated with chronic infections" I mean to imply those lesions which exist when an infection is chronic in its course; that is to say, when it has been chronic always, as in some tuberculous infections, or when an acute or subacute infection has become what we call chronic because the resistance of the patient is then able to neutralize any generalized toxemia, or because the organisms present have been destroyed. Such a desirable state, or consummation, as chronicity is of immense importance to the surgeon. By the recognition of the great safety of operation in these circumstances as compared with the dangers of extensive interference in acute and subacute conditions, we have completely altered the mortality-rate in regard to pelvic infections. I cannot here discuss the ways and means employed to avoid extensive interference in cases that are not chronic; but I think it is important that I should emphasize the desirability of the adoption, especially for teaching purposes, of some definite clinical chronicity-test. My own rule is that, if a patient whose temperature has been absolutely normal for some time show any degree of pyrexia on the evening or day following vaginal or rectal examination, an eradicative operation must not be performed. The patient must be able to stand handling without showing

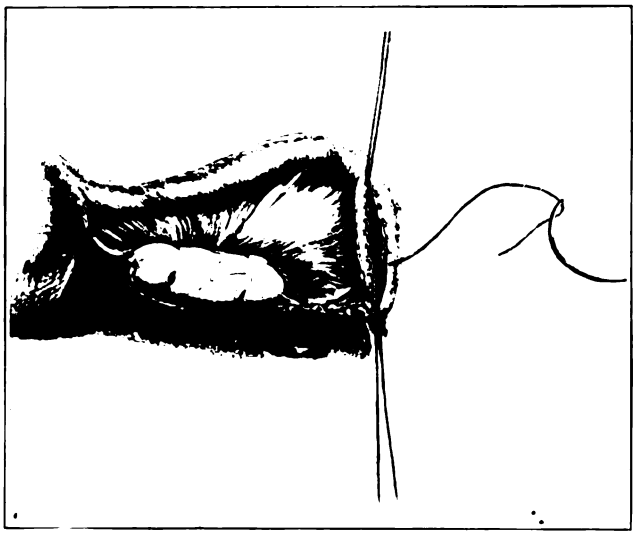

Fig. 1.—Salpingostomy: author's method.

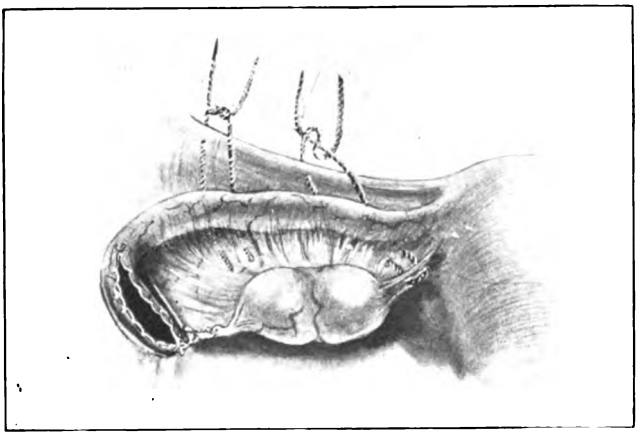

Fig. 2.—Suspension of tube and ovary—author's method—after salpingostomy has been performed.

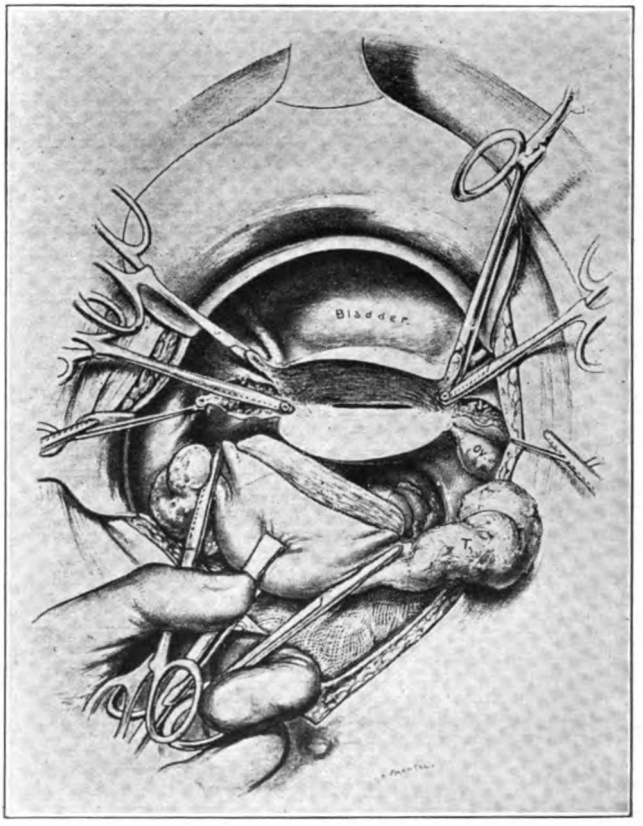

Fig. 3.—Author's operation of acrohysterosalpingoöphorectomy, first stage. In the illustration the right ovary is shown to have been retained. This is rarely possible.

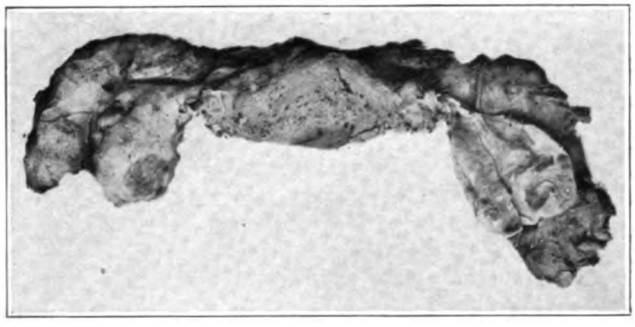

Fig. 4.—Specimen removed at the operation of acrohysterosalpingo-öphorectomy; a portion of the right ovary has been removed for grafting.

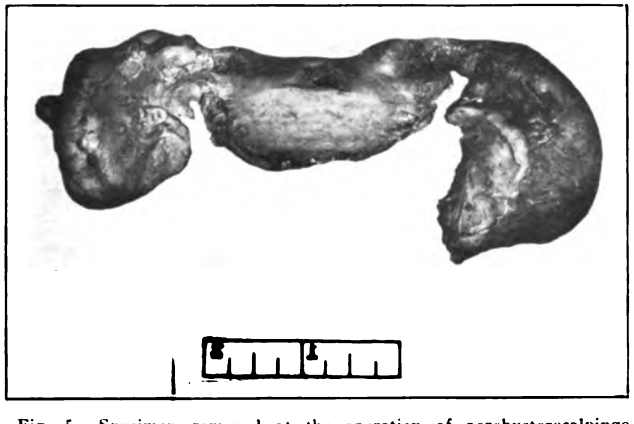

Fig. 5.—Specimen removed at the operation of acrohysterosalpingo-öphorectomy; a portion of the right ovary has been removed for grafting.

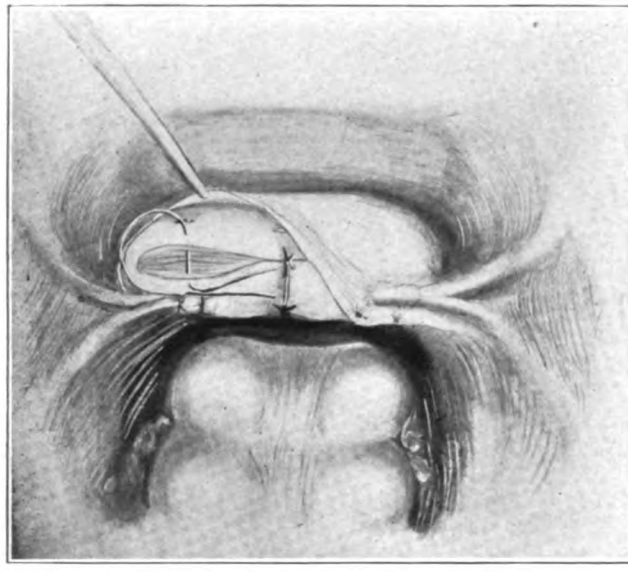

Fig. 6.—Final stages of the author's operation of acrohysterosalpingo-ŏphorectomy.

any reaction before such an operation is safe. This is of most importance, of course, when we are dealing with lesions primarily due to streptococcal infection; but, as other infections, especially gonococcal, may be complicated by streptococcal invasion this test should always be applied.

It is well known to every scientific surgeon that the commoner organisms infecting the internal genitalia produce somewhat different lesions. Yet, at any rate in Great Britain, I do not think that this pathological knowledge is often enough taken into account when the surgeon is dealing with the lesion present. Sometimes too much is done; more often, perhaps, too little. Albeit in no other surgical enterprise is the essential principle of scientific surgery seen to so great advantage as when properly applied to the lesions associated with chronic infections in the female pelvis: namely, the removal or treatment of diseased structures, without which the symptoms cannot be cured, with conservation, as far as possible, of function.

PUERPERAL STREPTOCOCCAL INFECTIONS

The streptococcus, unlike the gonococcus, does not usually lead to destruction of the lining membranes of the uterus and Falloppian tubes. This organism tends, rather, to pass through the mucosa to reach the lymphatics. Abscesses may, however, result from an acute infection in the uterus, tubes and ovaries; but, in my experience, abscesses in the uterus and tubes require intervention before they can become chronic, whereas abscesses in the ovaries may be encountered in a quiescent state. The chronic lesions, then, may consist of chronic metritis (*fibrosis uteri*), as a separate pathologic entity, or of salpingitis with the production of a hydrosalpinx or a sealed abdominal ostium, either alone or associated with an ovarian abscess. Such infections are often limited to the appendages of one side.

When the lesion is unilateral it is necessary to remove only the tube and ovary of the affected side, if no conservative operation, such as salpingostomy be indicated.

If both tubes be occluded but not distended, and at least one ovary appear to be little affected, then salpingostomy on one or on both tubes should be practised. It is useless to perform salpingostomy on a hydrosalpinx, for the uterine end of the tube is blocked.

If both ovaries contain abscesses they must be removed, and a portion of one must be grafted. If this be necessary, conservative operations on the tubes are, of course, unnecessary.

When, usually many years subsequent to infection, a uterus in which extensive fibrotic changes have taken place is encountered, vaginal hysterectomy should be performed to save the patient from the evil consequences of excessive menstrual losses. Generally, in these circumstances, the appendages are healthy.

APPENDICULAR INFECTIONS

Appendicitis in women is always an operation for the gynecologist. Only too frequently the right ovary and tube, if not the left appendages also, are involved. Since the infection, which consists of an invasion by organisms from the large bowel, has spread directly from outside, the lumen of the Falloppian tube is but rarely implicated. The tube and ovary, on one or on either side, become bound down, and the abdominal ostium becomes occluded by peritoneal adhesions. The ovary usually becomes cystic. When the infection is severe, suppuration in the ovary and tube may occur; but I do not think this is common. The uterus, of course, practically always escapes.

In a large majority of cases, it is, then, only necessary for the surgeon, after the appendix has been removed, carefully to cut through adhesions which are generally fine, to excise cysts from the ovaries and, when the abdominal ostium is sealed, to perform salp-

ingostomy. Afterwards, the tube and ovary should be supported by fixation of the ovarian ligament to the round ligament (Figs. 1 and 2).

The functional results of salpingostomy cannot yet be stated with certainty, at least so far as my own cases are concerned; but the fact that conception does occasionally follow this procedure encourages me to hope that with improvements in our technique it will more often be successful. Moreover, it is consoling to the patient to know that there is a possibility, however remote, of subsequent pregnancy.

TUBERCULOUS INFECTION

There is still need for further observations on the origin and dissemination of infections by the tubercle bacillus in the female genital organs. Here it may be found apparently as the only somatic tuberculous focus in young girls. In adults, quite commonly it follows tuberculous infection of the peritoneum. Is the lesion seen in young girls secondary, therefore, to infantile tuberculous peritonitis, from which the patient has recovered, or is it the result of some obscure blood-conveyance, and, if so, whence has it come?

In the few cases in which I have observed this condition in girls, there has usually been complete arrest of the genital functions, with implication of all the internal reproductive organs. In such circumstances, if surgical procedures be indicated, complete removal of the genital organs is necessary. If an ovary appear on examination to be unaffected, it may be left. Happily, these lesions in young girls are rare.

On the other hand, tuberculous infection of the genital organs occurring during the young adult reproductive period is unfortunately common. We have usually to deal with two distinct phases—I say "phases" rather than "types" because I believe the origin of tuberculous infection in adults is almost always the result of previous peritoneal infection. The first phase

is that in which there is generalized tuberculous peritonitis often accompanied by a considerable effusion of free fluid into the abdominal cavity. In these circumstances we find thickened peritoneum, studded with small tubercles in the pelvis, as elsewhere, covering the uterus and tubes; the tubes are swollen, but the ostia are open and the lumina may contain no pus; the ovaries are frequently unaffected, and only the peritoneal surface of the uterus is involved.

What treatment are we to adopt? Is it sufficient to evacuate the fluid from the peritoneal cavity and to trust to the recovery of the pelvic peritoneum along with that lining the rest of the abdominal cavity? I do not think it is, although I have in the past sometimes contented myself with evacuation of the free fluid in the abdomen, and have left the tubes in the hope that they might escape luminal infection. But my hopes in this respect have not been justified. The following case indicates what I believe not infrequently occurs if the tubes be left.

A woman, aged 34, when first seen, complained of abdominal pain which had commenced after a confinement, six months previously. Her abdomen was full of free fluid, obviously the result of tuberculous peritonitis. I evacuated the fluid and removed the appendix, but did not interfere with the genital organs, which appeared unaffected except on the peritoneal surfaces. Thirteen months subsequently she consulted me again, when I found that the appendages were grossly infected. Laparotomy was performed once more, and it was observed that the general peritoneal cavity and the pelvic peritoneum had completely recovered, but that the tubes and uterus were seriously diseased. The ovaries appeared to be normal. I performed panhysterectomy with removal of both tubes and the left ovary. The tubes had been converted into pyosalpinges, and the mucosa of the uterus, including that of the cervix, was diffusely infected.

Some months later, the patient was found to be suffering with tuberculous ulceration of the vault of the vagina. This was scraped and cauterized, and apparently cured. Later, I heard that the patient had been treated by a physician for tuberculous pleurisy.

It appears to matter little, therefore, whether the tubes are obviously involved in the presence of a gen-

eralized peritoneal infection or not, for by the time the patient seeks advice and the fluid is evacuated the lumina are infected in almost every case. The practice on which Mayo and others have insisted should be followed: the tubes must be removed when the peritoneal fluid is evacuated, and I think it wise to remove with them the uterine cornua.

The ovaries are unaffected, as a rule, by an infection reaching them from without, that is, from the peritoneum. Hence, it is usually safe to leave one of them if it should show no obvious lesion, or to graft a portion of it.

In those cases of tuberculous infection of the pelvic organs in which the peritoneal infection has subsided, it is, I think, usual to find bilateral pyosalpinges which may be associated with ovarian abscesses. The uterus may be affected; but in many old standing cases, this is found to be so only in regard to the cornua, if this organ is infected at all. Sometimes there is menorrhagia, but more often there is scanty menstruation or amenorrhea. In most instances, especially when the ovaries are involved, the tubes, ovaries and the uterus should be removed. Sometimes it may be possible to graft a portion of an ovary.

GONORRHOEAL INFECTIONS

I need say nothing to an assembly such as this of the frequency of ascending gonorrhoeal infection of the female genital tract.

By the time the patient presents herself for treatment, surgical interference alone usually offers the only satisfactory and sure prospect of relief; but surgical treatment to be successful must, as always, take account of the symptoms and lesions present.

If the infection have been slight and the patient's resistance have been high, the tubes alone may show pathological changes: hydrosalpinges have formed. The uterus has entirely recovered and the ovaries have

never been affected. All that is necessary, therefore, is the division of adhesions and the removal of the tubes. Should an ovary be cystic it may be removed or the cyst excised.

With regard to the more serious lesions produced by the gonococcus, there are four points in the pathology and symptomatology that require consideration. First, the gonococcus tends to remain long localized in the mucous membranes and to destroy that in the tubes. Second, sterility is practically inevitable when the tubes are involved. Third, the ovaries are frequently infected. Fourth, a large majority of all patients so affected suffer with menorrhagia. In many of these cases, there are, then, cervical infection, bilateral pyosalpinges, infection in a lesser or greater degree of the ovaries and of the fundus uteri. The treatment is, accordingly, based on the conditions present.

The cervix, if it be lacerated or be still in a state of live infection, should first be amputated; but often it is entirely quiescent, noninfective and in the virgin state.

In sexually active women, who form by far the largest class of patients, when the fundus uteri and appendages are attacked, my practice is to perform the operation I described some years ago. By this operation I excise in one piece the tubes, ovaries and a transverse wedge-shaped portion of the fundus uteri (Figs. 3, 4 and 5). Afterwards I unite the uterine flaps, attach the stumps of the infundibulopelvic and round ligaments to the posterior aspect of the reconstructed uterus on either side, and then cover the uterus and all raw surfaces with a flap of peritoneum dissected from the uterovesical pouch and anterior surfaces of the broad ligament (Fig. 6). Subsequently, I make an ovarian graft. A somewhat similar operation on the uterus and tubes—without ovarian grafting—has been independently devised and practised by Buettner of Geneva. In the first forty cases published by this surgeon and his assistants there were five deaths—a very

high mortality. I have at the time of writing, performed my operation 125 times with the loss of only two patients, one of whom died from an intercurrent affection.

Functional results have been obtained in over 80 per cent. of all my cases of ovarian grafting. Of the cases in which menstruation has been possible, owing to a portion of the uterus having been retained, menstruation has occurred in 70 per cent.

I regret that time will not permit my discussing ovarian grafting in more detail and at greater length. I wish, however, especially to urge that this valuable procedure be practised in cases in which it is not safe to leave an ovary in the pelvis lest it become adherent and cystic. There are still some of us who are satisfied by the experimental and clinical evidence at our disposal that the ovary is of real importance to the sexually active women. In women nearing the menopause, I sometimes perform supravaginal or complete hysterectomy, but almost invariably I make an ovarian graft, which even at this time of life is of immense value in tiding the patient quietly over what may wise be a stormy climacteric.

CONCLUSION

In the foregoing remarks I have attempted very briefly to outline my own practice in the treatment of lesions associated with chronic infections, and I have tried to explain how my methods are based on a conception of the pathological actualities and possibilities, and on the importance of the conservation of function when this is practicable.

38 Rodney Street.

ABSTRACT OF DISCUSSION

Dr. C. Jeff Miller, New Orleans: It should not be necessary to stress the importance of preserving the function of the generative organs, but it is unfortunately true that many surgeons operate in the acute stage of infections,

when nothing short of a radical operation could be done. Pelvic infections almost invariably become sterile, exudates disappear, and a fair percentage of cases will never require operation; and, if an operation is eventually necessary, it is surprising how much of the structures can be saved, and how often some plastic measure is possible. Conservative work, however, requires a great deal of experience and a knowledge of pathology, in order to obtain the best results; types of infection must be differentiated whenever possible, and if a conservative operation is contemplated, gonorrheal infection should be eliminated, or results are by no means gratifying. In my experience, conservative work has been more applicable to puerperal lesions than to other types, since we do not find the lumen of the tube so often damaged. The removal of adhesions about the tubes and fimbriae following puerperal infections is most satisfactory, and in such cases the plastic operation devised by Dr. Bell is especially applicable. In tuberculous lesions, conservative measures are to be discountenanced. In 90 per cent. of cases of tuberculosis of the pelvic organs, the tubes are involved, and in 25 or, possibly, 30 per cent., the endometrium is involved. In these lesions, the tubes should always be removed, and in the majority of instances a hysterectomy is indicated. As to ovarian grafting, I approve of Dr. Bell's stand on this subject. During the last eight years I have resorted to ovarian grafting in about thirty cases, and the results have been most gratifying. It is usually possible to save at least a portion of an ovary, and even a small remnant will frequently preserve menstruation for months or years, and permit of a gradual menopause. I have often deliberately transplanted an ovary, when the condition of the pelvis was such that I felt that adhesions would follow the operation, having found by previous experience that not a single patient subjected to ovarian grafting had suffered afterward during menstruation. With one exception, menstruation was reestablished within four months in every case. Some women menstruated from one to two years; others have menstruated as long as eight years. I believe that many have been disappointed in ovarian grafting because of the technic adopted. The method presented by Dr. Bell is an ideal one, and if followed in detail will be found satisfactory. Excising the fundus of the uterus, together with the tubes is applicable in some cases, but by no means good as a routine operation. I have performed the operation in several instances, but I felt that the convalescence and condition of the pelvis afterward was not so good as when the tubes were removed thoroughly at the cornua, and the peritoneum carefully closed over the stumps. In two or three instances metrorrhagia developed sometime after the operation, and one case required the removal of the balance of the uterus. I think the operation especially applicable in young women,

when the uterine structures appear involved, and when a special effort is to be made to preserve menstruation.

DR. ARTHUR CURTIS, Chicago: In a recent study of the bacteriology and the pathology of the fallopian tubes removed from about 300 women, I have been more than ever impressed with the importance of making a differentiation of the etiologic cause of these infections, because the treatment should differ according to the organism which is causing the trouble. In gonococcal infections, in a study of the entire tube where it has been thoroughly ground so that we are sure we missed no bacteria which might possibly be buried in the tissues, it has been found that we are never able to obtain the gonococcus more than ten days or two weeks after fever and leukocytosis have disappeared entirely. This means that chronic infection in the fallopian tube in case of gonorrheal disease almost never exists. Those instances in which we have heretofore made a diagnosis of chronic salpingitis are really reinfections from the original external source, or recurrence of infection due to ascent of the gonococcus from the infected lower genital tract, especially from the cervix. Again, I have noted that if one isolates the patient from the source of her infection at the beginning of salpingitis, almost never does a lesion of very severe degree follow; the tubes are not markedly altered, and the patient has limited symptoms. In streptococcic infection the story is different. Instead of the bacteria quickly disappearing, one is often able to isolate the streptococcus in considerable numbers, not only months but many years after the origin of the infection. Another diagnostic feature of importance is that in streptococcus disease we are apt to find extremely firm adhesions; the same is true of tuberculous salpingitis, easily amenable to separation by blunt dissection, with either the scissors or the fingers. Indications for operation in streptococcic and in tuberculous infections are quite similar. In the severe infections it is advisable to be rather radical because viable bacteria are often still present. If there is a questionable ovary, it is desirable to remove it, whereas in gonococcic infections with slight ovarian involvement we may leave the ovary because we know the organisms have already disappeared.

DR. SIDNEY A. CHALFANT, Pittsburgh: After listening to Dr. Bell, I realize that my technic has been faulty. I have been in the habit of placing the graft under the skin, but on top of the fascia, realizing that the blood supply was not of the best, and fearing to place it deeper on account of infection. I had one graft that became infected and sloughed out after a few days. Accordingly, my results have not been so good as Dr. Bell's. I have had the same experience, the amenorrhea with all the symptoms of the menopause varying from four to six months; then a recurrence of menstruation persisting for a number of years. I have felt,

too, that the graft was of value in cases in which the uterus had been removed and menstruation was impossible. In comparing the number of those cases with the patients who had had a previous complete hysterectomy without graft, I have found that there was a definite lessening of the severity of the menopausal symptoms. The persistence of streptococcic infection has been proved by two tragedies. One patient sustained a fracture of the femur on her way to the hospital for her operation, having been struck by an automobile. For three or four months she had a normal temperature, except during an attack of acute tonsillitis about three weeks before operation. The test, as suggested by Dr. Bell, was negative. Examination made on two occasions preceding her operation was without any resultant rise in temperature. She developed an acute streptococcus peritonitis and died within thirty-six hours. There was a little leakage of the tube at the time of operation, which probably was the source of infection.

DR. GORDON COPELAND, Toronto, Canada: Would you not differentiate genital tuberculousis into two classes? Tuberculosis is a systemic disease, and the genital infection in the majority of cases is only one part of the whole complex. Those of us who have given some attention to heliotherapy, especially following the work of Rollier, have been impressed by its importance. In many cases a thorough treatment by this method will totally eradicate the genital tuberculosis together with manifestations of the disease in other parts of the body. There are certain cases in which the indications would be to use the more conservative methods of heliotherapy first. In the majority of cases, if a cure is not effected, it will at least improve the patient's general condition so that she will stand operative procedures better.

DR. HENRY SCHMITZ, Chicago: In the Cook County Hospital, tubal infections amount to 75 per cent. of all cases that come under observation. While in private work 50 per cent. of tubal infections are operable, in the Cook County Hospital the indications for operation are more numerous. These patients are entirely dependent on the county when physically disabled, and their mode of living is such that if we treat them conservatively they go back to their old ways and return to the hospital with the same infection. The result has been that I have been very radical in the treatment of these conditions. As soon as the patient's temperature has remained normal for one week, I resort to the bilateral operation. I remove the tubes and ovaries radically, no matter what the age of the patient. I save as much ovarian tissue as I can. It remains in the posterior culdesac. The ovarian tissue is cut into cubes. The rectus muscle on one side is split and the cubes are placed within the substance of the muscle. The ovarian tissue very easily slips out unless this is closed. It takes usually four or five months before these patients will begin to menstruate. They

rarely complain of any symptoms which may be attributed to menstruation.

DR. W. BLAIR BELL, Liverpool, England: There has been general agreement in the principles of dealing with these lesions. Just one or two points of interest have been raised. When Dr. Miller operates on the tuberculous pelvis he does a supravaginal hysterectomy. My procedure is simply to remove the tubes and the cornua of the uterus. Removal of the body of the uterus alone is not very good practice. It is better to remove the whole organ. If the fundus is infected, the cervix is also in the majority of cases. I was very much interested to hear Dr. Miller's experience of the menopause supervening after ovarian graft. My experience has been the same. When it does not remain that long, the menopause is a very easy one. I leave the fundus wherever I can, or a portion of it, in order to preserve menstruation. Dr. Curtis' work on etiology will be widely recognized all over the world. I agree with all the points he stated, especially in regard to the streptococcus. The test I mentioned is most accurate for streptococcic infections. Dr. Chalfant spoke of infection. I have put the graft in the internal oblique muscle. I think every one of these patients has menstruated since and has remained well. I agree with Dr. Copeland that the tuberculous infections must be divided into two groups. I was dealing only with local pelvic infections. Chronic infections of the pelvis with free ascitic fluid are, in my experience, almost invariably cured as far as the disease is concerned in that region. Not in one of my cases have I had a subsequent infection. Dr. Schmitz mentioned the question of the conservation of tissue in the pelvis. In very many cases an ovary becomes adherent again and it is no better than a satisfactory ovarian graft which will save the patient a further operation.

DEFECTIVE DIET AS A CAUSE OF STERILITY

A STUDY BASED ON FEEDING EXPERIMENTS WITH RATS *

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The application of the term sterility to most, or all, infertile matings has led to much confusion of thought. In most of them, the failure of reproduction is, in fact, the result of decreased fertility rather than of actual sterility on the part of the two individuals concerned.

Actual sterility of individuals, of course, exists. There are cases dependent on anatomic malformations and other pathologic conditions in which the individual may be pronounced sterile even when mated with a fertile partner, until the local condition has been remedied; but these actual sterilities of anatomic or pathologic origin probably constitute but a small proportion of the infertile matings in either the human or other species.

There are certainly a large number of infertile matings which are purely functional and due to physiologic alterations in general or local conditions. Such physiologic alterations moreover often coexist in the sterilities of pathologic origin and when unrecognized and consequently unremedied, undoubtedly explain a large proportion of the continued infertilities after operation.

* This work was aided by a grant from the Elizabeth Thompson Science Fund.

EXPERIMENTAL WORK

Evidence to this effect which had accumulated in the course of our clinical work led us to plan, in 1919, an experimental study of this subject, and the production of infertility by partial dietary deprivation in essential substances proved to be the most practical method. This work is still in progress and is to be repeated with numbers large enough to be of final evidential value and fit for complete statistical treatment; but the results obtained from the smaller numbers seem now to warrant a provisional report.

As we have already described the experimental work in detail in a paper read before the American Gynecological Society last week, and as limitation of space prevented our taking up there the application of our conclusions to the treatment of human infertility, we wish in this article to give a summary of the experimental work, together with our conclusions, and then to proceed to their application to the human race, and to the corroborative evidence derived from our clinical experience. The article on the experimental work will be published in the *American Journal of Obstetrics and Gynecology,* and will supply the arguments in favor of our conclusions which limitation of space forbids our introducing here.

We used in this work a strain of albino rats which has been produced by Dr. Helen D. King[1] of the Wistar Institute. They had been inbred at the time we obtained them for thirty-four generations by brother and sister matings with selection for strength and health. Although well and strong they were of slightly diminished fertility as compared with Dr. Castle's heterogenetic strain, which was frequently used for rematings in testing individual fertilities. More than 90 per cent. of the matings of Dr. Castle's rats were fertile, while only 65 per cent. of matings

1. King, Helen D.: J. Exper. Zool. **26**: 335, 1918; **27**: 1, 1919; **27**: 29, 1919.

from Dr. King's strain produced young when the rats were fed on the stock diet of Dr. Castle's laboratory. This figure of 65 per cent. is then the standard mating fertility for the check rats in our experiments which were on the stock diet of the laboratory.

We subjected rats of this strain to three deprivation diets, one of which was low in the fat soluble vitamin, one was low in calcium, and the third low in proteins.

TABLE 1.—COMPOSITION OF DEFICIENCY DIETS*

Diet Low in Fat Soluble Vitamin		Diet Low in Calcium	
Rolled oats	40.0	Whole wheat	67.5
Gelatin	10.0	Casein	15.0
Casein	5.0	Whole milk powder	10.0
Salt mixture (McCollum)	3.7	Sodium chlorid	1.0
Dextrin	40.3	Inert substance	1.5
Cod liver oil	1.0	Cod liver oil	5.0
Diet Low in Proteins		**Double Deficiency (War) Diet**	
Wheat	70.0	Wheat	60.0
Salt mixture (McCollum)	3.7	Sodium chlorid	1.0
Dextrine	21.3	Inert substance	1.5
Cod liver oil	5.0	Dextrine	32.5
		Cod liver oil	5.0

* It will be seen that each diet in this table contains an ample supply of all essential elements with the exception of the one for which it is designed to be deficient.

TABLE 2.—CHEMICAL ANALYSIS OF DIETS*

	Stock Diet	Low Fat Soluble Vitamin	Low Calcium	Low Protein	Double Deficiency or War Diet
Protein	18.0	19.6	23.4	8.4	7.1
Fat	10.1	3.8	6.7	6.5	6.3
Carbohydrate	55.3	63.1	53.6	69.5	72.3
Salts	4.7	4.5	2.6	5.0	2.1
Fiber	0.9	0.9	2.7	1.3	2.6
Moisture	11.0	8.1	11.0	9.3	9.6

* By comparing the various diets as to chemical constituents it will be noted that they are all adequate except for the designated deficiencies.

All these diets were given in unlimited quantity and were ample and similar in all other respects (Tables 1 and 2). These deficiencies were chosen as being those which are most often present in persons belonging to the well fed classes in the United States. To them we added a fourth diet which was deficient in both calcium and proteins. This diet gives an approximate representation of the most important deficiencies in the war and postwar diets from which portions of

Europe have been, and still are, suffering, and is therefore of interest at the moment.

These diets reduced the mating fertilities of our rats from the normal 65 per cent. to 55, 31 and 14 per cent., respectively, in the several classes of deficiency diets as shown in the column headed Mating Fertilities in Table 3. It delayed the appearance of

TABLE 3.—RESULTS OF MATINGS ON VARIOUS DIETS (KING × KING RATS) *

Diets	Number of Matings	Number of Positive Matings	Percentage of Mating Fertility	Percentage of Individual Fertility
Stock diet	23	15	0.65	0.81
Low fat soluble vitamin diet				
Proved	8	4	0.50	0.70
Unproved	13	4	0.31	0.55
Low calcium diet				
Proved	0	0		
Unproved	7	1	0.14	0.37
Low protein diet				
Proved	0	0		
Unproved	5	0		
Double deficiency diet (low in calcium and protein)				
Proved	3	0		
Unproved	5	0		

* This table shows the result of matings in which both partners were King rats and both were on the indicated diet.

TABLE 4.—VITAL ANALYSIS OF DIETS *

	Stock Diet (Ample in All Elements)	Low Fat Soluble Vitamin	Low Calcium	Low Protein	Double Deficiency (Low in Calc. and Protein)
Protein	18.0	19.6	23.4	8.4	7.1
Fat soluble vitamin	5.0†	1.0†	5.0†	5.0†	5.0†
Calcium	1.8	1.88	0.08	1.88	0.03

* The amount of the fat soluble vitamin cannot be determined by chemical analysis. The figures given represent the amount of the vitamin containing substance.
† Estimated.

fertility in rats raised on these diets and lowered its degree as shown in the curves which are reproduced for each class in Figure 1. These results were produced, as is shown in Table 4, by a mere decrease in the percentage of the deficient element, not by its absence, and without any other change in the life conditions of the rats.

The production of so much infertility by so slight a change is surprising; but it is explained by the probability which our work already makes evident, that many sterile matings result from very slight decreases in the individual fertility of the two animals concerned, as is apparent by reference to the columns headed Average Individual Fertility in Tables 3 and 5.

TABLE 5.—RESULTS OF REMATINGS ON VARIOUS DIETS (KING × CASTLE RATS)*

Diets	Number of Matings	Number of Positive Matings	Percentage of Mating Fertility	Percentage of Individual Fertility
Stock diet	10	7	0.70	0.70
Low fat soluble vitamin diet				
Proved	0	0		
Unproved	20	9	0.45	0.45
Low calcium diet				
Proved	0	0		
Unproved	19	6	0.30	0.30
Low protein diet				
Proved	0	0		
Unproved	12	6	0.50	0.50
Double deficiency diet (low in calcium and protein)				
Proved	0	0		
Unproved	0	0	0	0

* This table gives the results of remating rats from the negative matings of Table 3 with Castle rats of known fertility. Since such Castle rats are of practically 100 per cent. fertility the index of average individual fertility of their King rat partners is the same as the index of mating fertility. It will be seen that the individual fertilities of rats on the deficiency diets are so low as to have insured sterile matings with partners of the same grade (Table 6).

TABLE 6.—SCHEMATIC CHART OF FERTILITY*

Individual Fertility		Mating Fertility, per Cent.
1.0 × 1.0		1.00 or 100
0.9 × 0.9		0.81 or 81
0.8 × 0.8		0.64 or 64
0.7 × 0.7	Threshold for	0.49 or 49
		45
0.6 × 0.6	Reproduction	0.36 or 36
0.5 × 0.5		0.25 or 25
0.4 × 0.4		0.16 or 16
0.3 × 0.3		0.09 or 9
0.2 × 0.2		0.04 or 4
0.1 × 0.1		0.01 or 1

* The figures in this table vary from those actually obtained from the matings only in being restricted to even tenths for the sake of clearness. The establishment of 45 per cent. as the threshold for reproduction must, of course, be regarded merely as an approximation until larger numbers have been employed.

The fertilities of individual rats were then obtained by repeated matings and by rematings with Castle rats of known fertility. When the indexes for all the matings were placed in a column in the order of

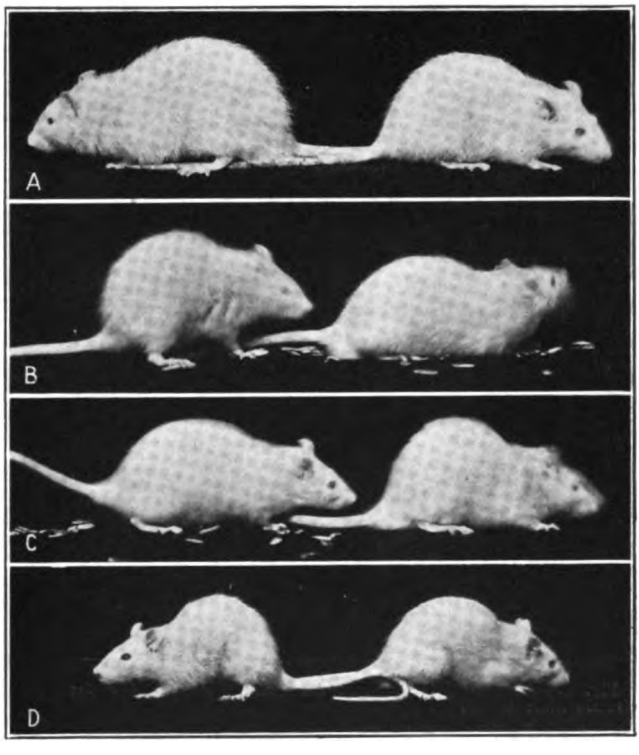

Fig. 2.—*A*, rats fed on stock diet; *B*, rats fed on low fat soluble vitamin diet; *C*, rats fed on low calcium diet, and *D*, rats fed on double deficiency or war diet.

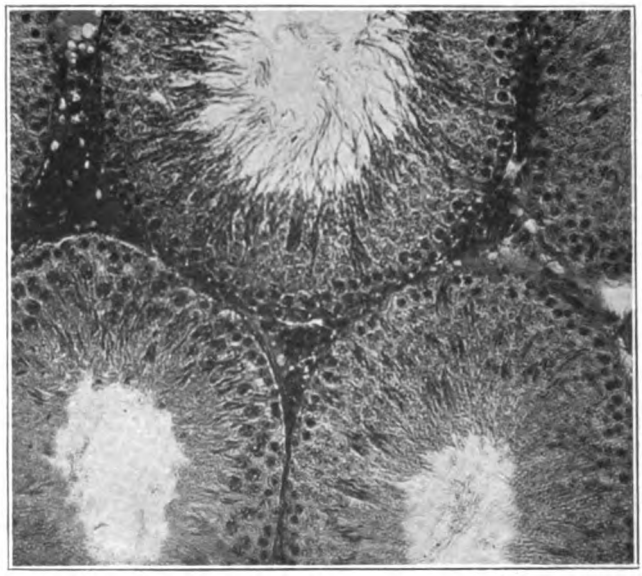

Fig. 5.—Section of testis from rat made sterile by low fat soluble vitamin diet; × 500.

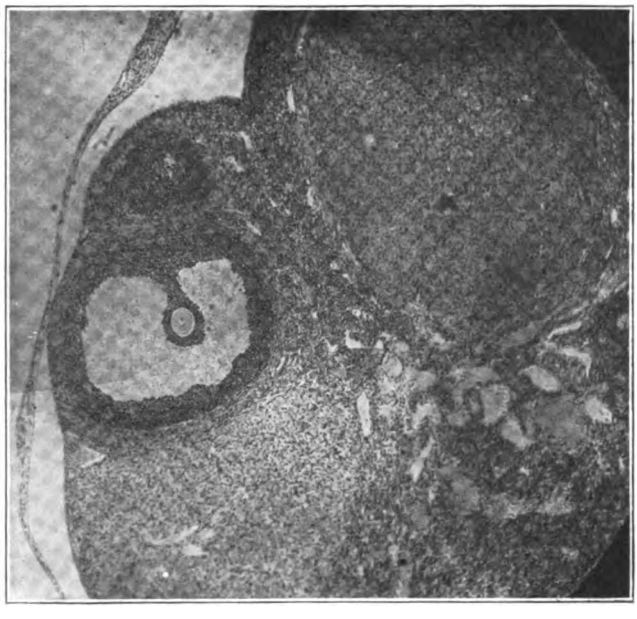

Fig. 6.—Section of ovary from rat made sterile by low calcium diet; × 300.

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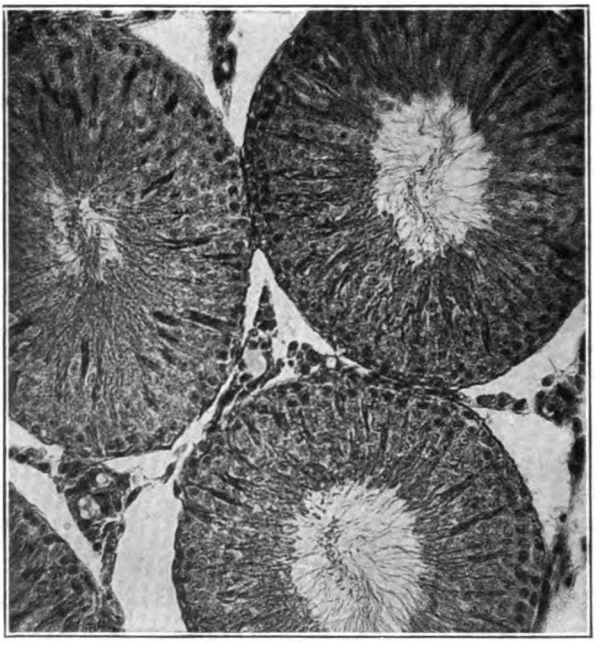

Fig. 7.—Section of normal testis; × 500.

Fig. 8.—Section of normal ovary; × 300.

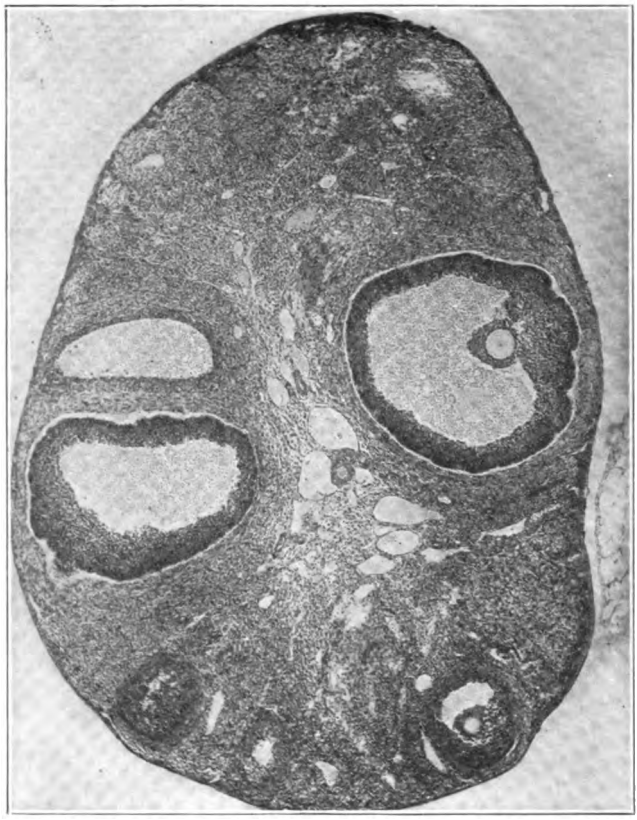

Fig. 9.—Section of ovary from rat made sterile by war diet; × 300.

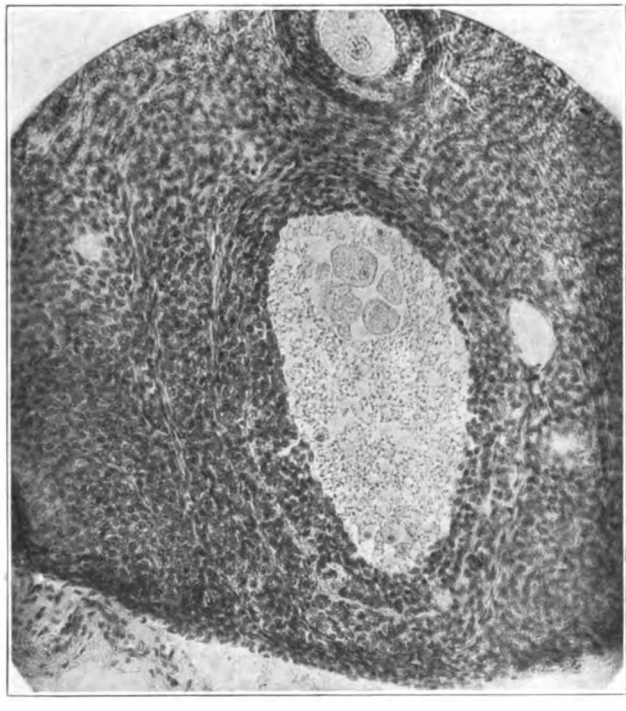

Fig. 10.—Section of ovary from rat made sterile by war diet; × 500. Four cells in the follicle may be noted.

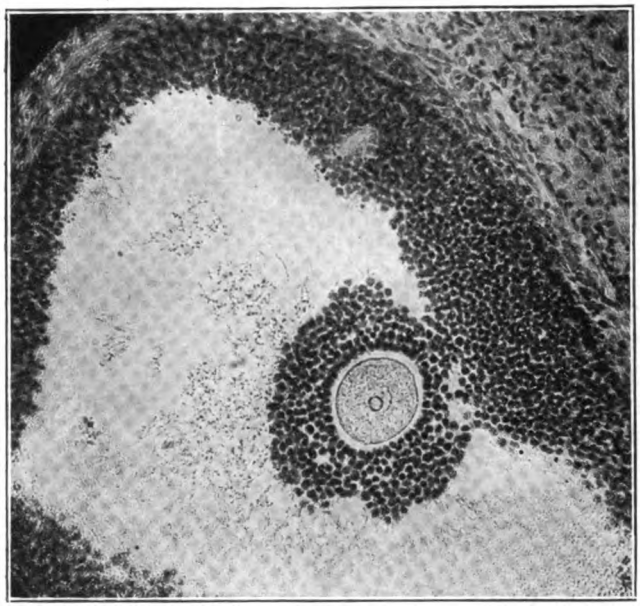

Fig. 11.—Section of normal ovary; × 500.

their fertilities, it was found that reproduction did not occur when the calculated fertility of the matings was below 45 per cent.

This result [2] is given in Table 6, in which for simplicity only a small number of representative matings are introduced. In this method of estimation it was assumed that the fertility of a mating may be represented as the product of the individual fertilities of the two animals, as, for instance, $0.8 \times 0.8 = 0.64$, which is the mating fertility of the King rats on our stock diet, or $0.6 \times 0.6 = 0.36$ which would be negative

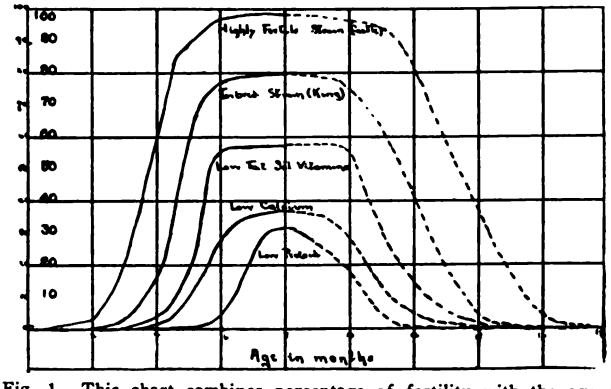

Fig. 1.—This chart combines percentage of fertility with the age at which reproduction first occurred for Castle rats, for King rats and for rats on the three single deficiency diets. The dotted half of each curve does not represent actual observations, but conforms roughly with the sexual life of these animals. The sharp rise corresponds to puberty and the sharp fall to the cessation of sexual activity. Note that the effect of deficient diet is to shorten and depress each curve as a whole.

mating. A mating fertility of 0.45 was found to be the "threshold for reproduction," below which young could not be expected and above which their arrival would be predicted.[3]

The threshold was not only approximately accurate when the rats used were of equally decreased fertility,

2. The result was obtained from rats on stock diet and will be retested with those on deficiency diets, though we have seen no reason to doubt its applicability.

3. In fact, study of all the matings made revealed that there were but two exceptions to this rule—in one case, young were produced in a mating with an index of 0.40, and in one mating with an index of 0.49, no young were produced, but these were the only exceptions out of thirty-three matings.

but also held true when a rat of lowered fertility was mated to one of higher or full fertility (e. g., $1.0 \times 0.5 = 0.50 =$ reproduction, $0.8 \times 0.4 = 0.32 =$ a sterile mating, etc.).

Repeated experiments showed moreover that if rats whose individual fertility had been decreased to, for instance, 0.6 were mated, their mating was sterile and remained sterile so long as these rats were kept together; but that if these rats with individual fertilities of 0.6 were each remated with highly fertile rats from Dr. Castle's strain the matings would both prove fertile.

These results frequently prove most illuminating when we come to compare them with problems which arise in the infertilities of the human race.

Another feature of the experimental work which is most interesting and important is the very slight change in the general condition of the rats which was produced by the single deficiency diets in spite of the great decreases in the fertility of their matings. This is shown in the illustrations of representative individuals from the several classes (Fig. 2 *A, B* and *C*) and by the individual weight curves shown in Figures 3 and 4. This also proves important when compared with clinical observations.

In Figure 2 *D,* a pair of rats which were brought to maturity on the double deficiency diet (the war diet) are shown. Their small size and poor condition is very evident when compared with the photographs of rats on the other diets. The individual weight curves are also evidence of this. This marked change of condition was attended by great loss of fertility, all their matings with each other proving sterile. We have obtained European statistics which show a corresponding decrease in human fertility in the countries of central Europe, notably in Austria, but lack of space forbids the reproduction of these statistics in this paper.

It seemed possible that the mechanism by which these infertilities were produced might be elucidated by study of the testicles and ovaries of the comparatively infertile rats, to which end we made serial sections of many of these organs. We intend to continue this study.

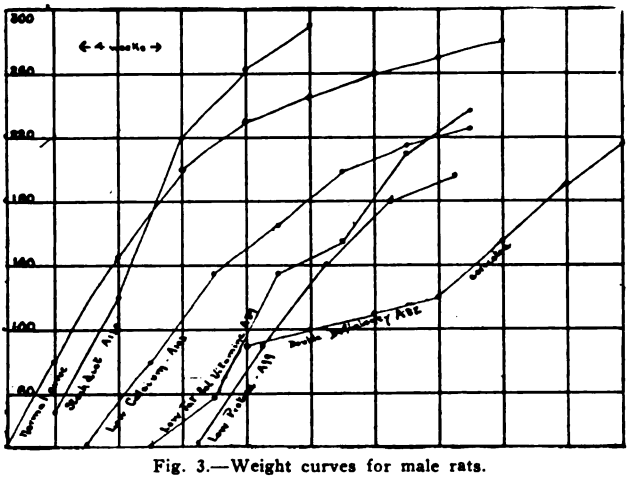

Fig. 3.—Weight curves for male rats.

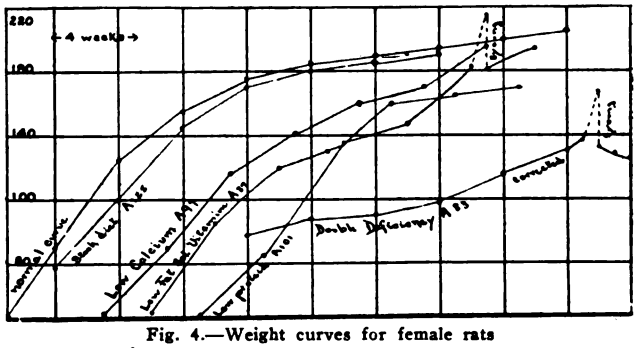

Fig. 4.—Weight curves for female rats

The work of Robinson [4] on prenatal death makes it probable that certain ova [5] contain within themselves conditions which make complete development

4. Robinson, Arthur: Edinburgh M. J. **26**: 137 (March) 1921.
5. Probably also certain spermatozoa.

impossible; but these conditions may, or may not, be morphologically visible.

Figures 5 and 6 are sections from the organs of rats on the single deficiency diets. We exhibit them with the statement that when compared with sections from normal animals (Figs. 7 and 8) they show no anatomic changes which have been demonstrated under the methods so far employed.

Figures 9 and 10 are sections of ovaries of rats on the double deficiency diet with their more extreme infertility. These ovaries do show several peculiar conditions which must be studied further, notably ova contained in unruptured graafian follicles which are composed of four cells. This section (Fig. 10) is to be compared with a normal ovum under high power (Fig. 11). These may be ova which have undergone premature segmentation; they may represent the development of four ova in a single follicle. We are uncertain what they represent and can at present make no statement about them except that they are plainly abnormal.

One further observation must be noted before we turn to the consideration of human infertility. We have been unable to find any mention of the birth of macerated fetuses in the literature, and Professor Castle has seen no such instance in the many years during which his laboratory has contained large numbers of rats on stock diet. But in matings on our single deficiency diets four such deliveries occurred and there were two more in eight deliveries in which young rats who had been reared on the war diet were subsequently placed on ample diet and bred to Dr. Castle's rats. This fact corresponds to a single but suggestive clinical observation which will herewith be reported.

HUMAN INFERTILITY

It is always unsafe to reason from one species to another, and the difficulties are increased when the

organic constitution and life conditions of the one species are widely different from those of the other. Moreover the experimental methods which are easily utilized in rats and which give us their individual indexes cannot be applied to the infertilities of the human race; but if clinical observations are found to yield results comparable to those of the experimental work each supports and reinforces the other. The life conditions of the human race are much more complex than those of laboratory rats. Human diet is much more varied and many factors other than diet enter into the maintenance of a state of general good condition. In the well fed classes in this country the food placed upon the table is usually sufficient in all the essential elements, but peculiarities of taste or mistaken dietary theories not infrequently lead to the choice of a diet which is insufficient in one or the other of the vital elements.

The history of a couple who were referred to us in 1919 offers a parallel to the miscarriages observed in our rats on deficiency diets.

The husband was normal in every way and thoroughly fertile. The wife was a large, well nourished woman in ordinarily good health, but reported herself as lacking in energy and constantly tired, perhaps in a condition quite comparable to that of the single deficiency rats. They had been married seven years. Ten months after marriage, she was delivered of a full term child which was alive at the beginning of labor, but died during an operative extraction. During the succeeding six years she had five pregnancies which resulted in five early miscarriages. These people were in the habit of maintaining a very ample table, and a deficiency in diet seemed absurd; but since an exhaustive examination failed to reveal any other cause for the habit of abortion, an inquiry was instituted.

It was found that during her first pregnancy (which went to term) she had eaten everything, but that finding herself growing stout soon after the birth of the child she had then begun to restrict her diet. On analysis it proved that she had been living for the six years during which she had miscarried repeatedly, on a diet which was very deficient in calcium. She was at once put on large doses of calcium, her diet was rearranged to include foods rich in calcium and after a

reasonable interval the medicinal calcium was discontinued. She went into her seventh pregnancy shortly afterward and without any other treatment was delivered at term of a healthy child.

No single case proves anything, but when this is considered in connection with the experimental work in rats and with similar results obtained by Steenbock[6] in swine and cattle it suggests the question whether dietary deficiencies may not be worthy of consideration in other cases of habitual abortion in the human race.

In laboratory animals the importance of individual peculiarities has been but little, if at all, investigated. In human beings individuality is a very important factor. We have seen a number of cases of infertility in young athletes who have abandoned training and gone into sedentary business life. It seems probable that such men acquire or possess a necessity for the ingestion of a large amount of proteins and the exercise which is necessary to carry them off, and that with a change in habit they fail in fertility.

In March, 1920, a young couple were referred to us from New York for analysis of their case. They had been married four years, and pregnancy had occurred shortly after marriage but had terminated in a miscarriage at three months. There had been no further pregnancies. The wife appeared to us to be probably fertile, the husband's semen had been examined several times by a well trained physician and considered normal because the field always contained spermatozoa in active motion. On more careful examination we found that their numbers were far below the normal, the percentage of motility was small and the character of motility was poor. The heads of most of them contained an abnormally small amount of chromatin. From our experience with similar cases we believed him to be decidedly infertile. He had been a well known college oarsman, and had rowed for five years, eating during a large portion of each year the enormous supply of proteins of a training table. He had then entered a professional school, had changed suddenly to a sedentary life and to very hard mental work. He had married in the first year of this regimen, and though he had promptly

6. Hart, E. B., and Steenbock, H.: J. Biol. Chem. 39: 209 (Sept.) 1919. Steenbock and Humphrey: Research Bull. 49, Wisconsin Experiment Station.

impregnated his wife, the pregnancy was unsuccesful (remember the miscarriages in the rats) and no further inpregnation occurred. It proved on inquiry that he was at the time of his visit thinking of devoting the next six months to a graduate course which would mean easy work with ample time for exercise. He was also at the time under pressure to join a crew which was then training for a race a few months later. On our recommendation he decided to adopt this plan of three months' training with only moderate intellectual work and to return at the end of the three months for reexamination of his semen. The case fails in completeness from the fact that the second visit proved unnecessary as the wife found herself pregnant at the end of two months and a half. We have recently heard that she was successfully delivered at term.

In the human race nervous overstrain plays an important part in loss of good condition. This appears to be equally true in both sexes, but can be more accurately observed in the male by examination of the semen.

In December last, we were consulted by a couple who had been married five years without a pregnancy. The wife had been operated upon for local abnormalities but without result, and their physician was confident that the persistent infertility was due to defective fertility on the husband's side. He was leading a sedentary life with very heavy business responsibilities. He was about 18 pounds under the preferable weight of the insurance tables and had a low diastolic blood pressure. He was pale and decidedly nervous in manner and appearance. His testicles were very soft and decidedly small, a fact which we have noted repeatedly in cases of lowered fertility both in the human race and in the rats. Secretion obtained by massage of the vesicles and prostate was extremely watery. It contained a few leukocytes and not even a normal amount of prostatic salts. Examination of his semen revealed almost no spermatozoa, and those mostly still. He looked well except for his evident nervousness. He was advised to absent himself from business, to live in the open air, to go into light training under the advice of a professional trainer and to play golf and tennis in increasing amount as his condition improved. This advice was strictly carried out under extremely favorable circumstances. Four months later his semen was reexamined by his physician and the report sent us showed that numerically there were from 75 to 100 spermatozoa in a high power field—a very fair number. We should judge from the report that their motility was good, and no abnormality was detected. No pregnancy has as yet occurred, but so great an improvement in a short time is fair testimony

that his previous seminal condition was purely functional and the result of an overstrained nervous condition.

In human beings normal assimilation of the food ingested seems to be as important as the mere choice of food eaten, constipation is always important, and we have seen three cases in which deterioration of general health from intestinal retention was apparently the sole cause of infertility.

March 6, 1919, we were consulted by a young couple who were becoming worried because they had been married for ten months without pregnancy. The husband was in excellent health, the wife considered herself well but admitted that she was "run down." Her complexion was pale and pasty looking, she had been for some months troubled with persistent acne, she complained of backache and a sensation of weight in the pelvis.

On the table a satisfactory examination was prevented by the fact that an enormously overloaded sigmoid occupied almost the entire pelvis. Under liquid petrolatum, forced catharsis and increased ingestion of water the bowels were gradually emptied and at the end of a month were moving regularly under mild catharsis. The vagina and cervix had been considerably congested, evidently from obstructed pelvic circulation, and she had for some weeks been instructed to use vaginal suppositories of boroglycerin at night. At the end of eight weeks she was in greatly improved general health and they were to report after her impending period for a complete sterility examination. This period failed to appear, she proved to be pregnant and was delivered of a living child at term.

A decision that a given infertility is dependent on anatomic cause and demands operation should not lead to neglect of accessory constitutional conditions.

In September, 1913, we examined a husband and wife who had been married three and one-half years without a pregnancy. Examination revealed that the husband was thoroughly fertile, but the wife had an anteflexion of a much underdeveloped cervix. The cervical mucus was retained, inspissated and sticky. All the spermatozoa found in the cervix were entangled and unable to progress. The uterus was in right lateral version and there was a cystic right ovary. She was suffering from severe dysmenorrhea and sense of pelvic weight. Operation was recommended, and both a plastic and an abdominal operation were performed. Good results were obtained with an excellent convalescence. The dysmenorrhea and bearing down sensation were relieved and general health

improved, but no pregnancy resulted. Two years later reexamination showed that the cervix was patulous, the secretions normal and that the spermatozoa penetrated well, abundant numbers being found even at the fundus in post-coital examination. Everything local looked normal but pregnancy had not occurred. The patient, though improved in general health, was nearly 20 pounds under the insurance weight, tired easily and was still pale and nervous. She was in health, but in poor condition. She was put on a regulated diet designed to increase weight, in combination with regulated exercise. Under this regimen she gained 10 pounds in two months, and went away to continue the treatment. A year later she reported that she was six months' pregnant and she was subsequently delivered at term.

This patient was treated before our attention was called to the specific effects of diet, but is selected in illustration of our belief that many of our failures in past years were due to neglect of constitutional ill health in cases in which local abnormalities of etiologic importance had been relieved by minor or operative treatment.

COMMENT

The necessity for brevity forbids the report of further cases, but these have been selected as typical instances.

That many individual infertilities are functional rather than due to anatomic or pathologic causes; that very moderate decrease of fertility in both individuals may produce a completely infertile mating; and that, as was fully proved in our breeding experiments, two rats that are infertile to each other may both be fertile to other individuals, not because of obscure incompatibilities, but merely because of a decreased percentage of fertility in each, are points worthy of much consideration.[7]

We take pleasure in expressing our obligations to Professor McCollum, of Johns Hopkins University, and to Professor Mendel, of Yale University, who have aided us with advice and suggestions. We are greatly indebted to Professor Castle, of Harvard University, who gave us space in his laboratory in the Bussey Institution and has assisted us by advice and counsel throughout.

321 Dartmouth Street.

7. For the effect of diet on reproduction on which this paper was based see McCollum, E. V.: The Newer Knowledge of Nutrition, New York, the Macmillan Company, 1918. Osborne and Mendel: J. Biol. Chem. **35**, 1918; **41**, 1920; Science **45**: 294, 1917; J. Biol. Chem. **23**: 439, 1915; **20**: 351, 1915.

ABSTRACT OF DISCUSSION

DR. EDWARD REYNOLDS, Boston: This experimental work grew out of our clinical experience, and its results have thrown much light on subsequent clinical experience. The most interesting point seems to be the probability that merely decreased fertility on each side of a union may result in a permanently sterile mating, although each partner would be fertile to a new partner of high fertility. That deficient diet produces sterility does not rest on our experiments, but has been shown especially by many investigators for many species of animals. That decreased diet in degree insufficient to produce any noticeable ill health will produce a decreased fertility of individuals in a degree to make them infertile to each other, we think we have established. Turning to the human side, it is impossible in the more complicated human life to obtain the same accurate view, but as one's experience grows large, as cases accumulate, the weight of cumulative evidence grows strong. As time goes on we feel more and more convinced of the importance of the functional element in sterility, more especially when it is coincident with the anatomic or pathologic cause. And just as slight decrease in fertility from moderate deficiencies in the vital elements of diet produces infertile unions, so we are convinced that local alterations in the organs, insufficient to produce conspicuous ill health, do produce decreased fertility which results in a sterile union. Our present view of sterility in the human race is that each case demands extended and accurate analysis of each partner, general and local, and it should be conducted not on the principle of determining causes of ill health, but it should be a search for the lesser causes which decrease fertility to the point of producing sterile unions.

DR. W. BLAIR BELL, Liverpool, England: Fifteen years ago I called attention to the importance of the calcium metabolism in the reproductive function. I conducted a series of experiments on hens. I was able to tell when these hens laid eggs, when they did not lay them at all, and when they were going to lay them, simply by an examination of the calcium in the blood. I then pursued this question in regard to women. I showed that by an examination of the systemic blood one could exactly prognosticate their condition and ability in regard to menstruation. I have pursued these studies clinically ever since. I have for many years treated these cases of habitual abortion and some cases of sterility with calcium, with very good effects, on the whole. A woman must have a very active calcium supply in order to part with 800 gm. to her fetus in nine months. In some cases she draws on her teeth and bones to supply the deficiency of the blood. After the child is born, she requires a very high calcium content of the blood to carry on the function of lactation. This important matter must be worked out farther

if we are to prognosticate what leads to the deficiency. We are now in possession of methods whereby we can watch this calcium content very closely.

DR. ALBERT J. OCHSNER, Chicago: Those of us who are experienced practical farmers will be able to recall many instances in the breeding of domestic animals to which all of these principles that have been brought out by this excellent paper will apply. Every one of these principles has its definite application in our everyday work in breeding farm animals. Unfortunately, those facts that the practical farmer knows and uses in his work are not always applied scientifically to the human being, and are not proved as they are in this case. Some years ago when the breeding of pure cattle became an important part of the progressive farmer's business in this country, it was found that a large proportion of the highest type of cows were sterile; and it was found that a farmer owning a large herd of these animals virtually had to choose between destroying these animals as beef cattle, receiving for them almost nothing, or go out of the breeding business. So the veterinarians conducting the experimental stations made a careful study and found that the sterility in these animals depended to a large extent on the fact that the graafian follicles in the ovary had remained unruptured; that is, they remained stationary. Whenever these graafian follicles were ruptured, almost immediately the cow became fertile. Some years ago my brother, who is also a practical farmer like myself, applied this method of treatment to the human being, and since that time we have applied it in a large number of cases of sterility which were not due to the other ordinary and most common causes, and we have found that it is quite as effective in the human being as it is in animals. Under general or spinal anesthesia two fingers are placed in the rectum, and with these the ovary is pressed against the hand on the abdomen with sufficient force to rupture the follicle.

DR. EMIL NOVAK, Baltimore: The influence of diet on the function of reproduction was evidenced, on a huge scale, in the wave of amenorrhea (Kriegsamenorrhöe) which swept over the continental countries, especially Germany and Austria, during the recent war. This effect on menstruation was produced by a combination of the dietetic privations and the psychic factors associated with war conditions. As for the general subject of sterility, I have been impressed by the frequency with which the cause is to be sought in tubal obstruction. I have repeatedly encountered cases in which such measures as cervical dilatation or the use of cervical pessaries have been carried out, and in which the real cause of the sterility proved to be a chronic inflammatory tubal disease. These cases are sometimes difficult of diagnosis, as the tubes may show little or no enlargement on bimanual examination. On the other hand, there is a very

clearly defined group of cases in which sterility is the result of developmental defects of the uterus. These instances of genital hypoplasia are often observed in women who otherwise are perfectly healthy and well developed. The cause of such uterine hypoplasia is undoubtedly to be sought in the endocrine system, although the exact nature of the disturbance cannot be stated. Dr. Bell has done much work along the lines of calcium metabolism as related to the physiology of the female reproductive organs. My own feeling has been that such calcium fluctuations are merely a manifestation of a more deeply underlying endocrine change. Dr. Ochsner's reference to the production of sterility in cattle by corpus luteum cysts is interesting, and is, of course, known to all farmers and veterinarians. I do not believe that the same phenomenon takes place very frequently in human beings, although corpus luteum cysts are relatively common. They not infrequently cause amenorrhea, though usually of short duration. The question is sometimes asked as to why, if the corpus luteum causes menstruation, the persistent corpus luteum, in the form of a corpus luteum cyst, should inhibit menstruation. There is nothing paradoxical in this fact, if we remember that the corpus luteum, while it is essential to menstruation, does not actually cause the hemorrhage. It merely causes the preparatory or premenstrual hypertrophy in the endometrium. The actual menstrual hemorrhage is a catabolic or destructive process occurring in the endometrium when pregnancy does not supervene, its immediate cause probably being the death of the ovum thrown off at the preceding ovulation.

Dr. Donald Macomber, Boston: A possible explanation of the high occurrence of sterility in pure bred animals, as mentioned by Dr. Ochsner, is probably the fact that they are largely inbred. The strain which we used in our experiments had been inbred brother and sister matings for thirty-four generations. It showed a percentage of fertility of sixty-five as compared with ninety-six, which was the percentage of Dr. Castle's heterogenic stock. Dr. Ochsner and Dr. Novak spoke of the procedure common with veterinaries of rupturing cysts in the ovary. Dr. Reynolds has long practiced it in human beings. One must differentiate between retained graafian follicles which have undergone a certain degeneration and corpora lutea which instead of being absorbed persist and occasionally become cystic. The sterility of cattle, which is relieved by rupturing cysts in the ovary, is usually due to the presence of these cystic corpora lutea. In human beings it is not unusual to find them associated with underdeveloped anteflexed uteri. These patients are almost all of the slender, underdeveloped type, and often complain of dysmenorrhea. Removal of the corpora lutea often results in a return of ovarian function with relief of sterility. When the ovaries contain many small retained follicles, the inter-

ference with normal function is largely due to the increased tension. Puncturing these cysts by the mere mechanical relief of pressure often causes such ovaries to function normally. Dr. Novak spoke of the effect of the war diet in Europe. We have certain statistics for Austria which show that the birth rate has fallen more than 50 per cent. since before the war in spite of a slight increase in the marriage rate. Dr. Taylor of Pennsylvania reported that the diet of a large part of the population of Austria at present is one which is largely deficient in milk, butter and eggs. These foods carry most of the calcium of the food and are at the same time the chief sources for the fat soluble vitamin. Our experience has shown us that when two deficiencies are combined, the effect is much greater than when only a single deficiency is involved.

CHOLECYSTOGASTROSTOMY AND THE COURVOISIER GALLBLADDER *

CHARLES GORDON HEYD, B.A., M.D.
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NEW YORK

The clinical picture of chronic obstructive jaundice is so well recognized that it calls forth little comment. However, the rapid loss of weight, the emaciation and asthenia, the pruritus and disturbing mental depression, associated with cholemia, very often render imperative attempts at operative relief.

In a paper published in August, 1916,[1] entitled "Relief of Chronic Obstructive Jaundice by Palliative Operations," an argument was advanced for a more extended employment of cholecystogastrostomy. In the succeeding years, we have given this operation a far wider application and have utilized it in more varying pathologic conditions. Neoplasms or irremovable tumors involving the distal half of the biliary ductal system are the most frequent indications for diverting the bile current. There are, however, other lesser indications which may call for surgical intervention. These may be summarized, thus: (1) Mistaken diagnosis: Not infrequently a surgeon operates for supposed malignancy and finds the diagnosis has been incorrect, and by the institution of drainage, the inflammatory condition subsides with recovery of the

* From the Surgical Department of New York Post-Graduate Hospital, Dr. John F. Erdmann, Director. The material and cases on which this paper is based are from the collective surgical service of the department.

1. Erdmann, J. F., and Heyd, C. G.: Relief of Chronic Obstructive Jaundice by Palliative Operations, Am. J. M. Sc. **152**: 174 (Aug.) 1916.

patient. It is only upon such premises that the occasional "cures" of supposed cancer can be reasonably explained. "No one living is infallible in the differential diagnosis of obstructive jaundice. The diagnosis is always so difficult and the chance of a life saved is so important that however positive the evidence of malignancy may be I now advise operation in all cases."[2] (2) The relief of distention pain: All patients do not have pruritus or the mental depression of cholemia, but they suffer a gradually increasing pain from distention of the biliary apparatus. (3) Intractable pruritus: in many cases so severe that the patients positively demand relief. (4) Social: to prolong life in comparative comfort until such time as death takes place from metastasis or local extension of the growth. (5) As a preliminary measure in chronic jaundice when the origin of the obstruction is doubtful and when the condition of the patient with cholemia, asthenia and hemorrhagic tendency is such as to prohibit thorough exploration. (6) As a palliative operation in the aged and infirm. One has only to recall a patient on whom an emergency cholecystostomy has been performed with the idea of a more thorough surgical exploration later. Quite contrary to expectations, the second operation is attended with more danger than the first by reason of the great loss of bile that has taken place in the interim. It would seem that the patient's strength would have been more adequately conserved by a cholecystogastrostomy with internal drainage of bile into the gastroduodenal segment. (7) In certain patients with recurrent cholecystitis and cholangeitis, incompletely cured by cholecystostomy and in whom the closure of the sinus brings about an attack of jaundice and ascending biliary infection. Closely associated with this condition is an ill-defined group of cases with biliary cirrhosis sequential to chronic cholangeitis in whom

2. Moynihan, B. G. A.: Abdominal Operations, Philadelphia, W. B. Saunders Company **2**: 437, 1914.

cholecystogastrostomy affords a remedial measure of undoubted value. (8) Cholecystogastrostomy is possibly indicated as a therapeutic measure in the treatment of certain types of ulcer of the stomach.[3]

FUNCTIONAL SIGNIFICANCE OF BILE

Our knowledge of the functional significance of the bile is by no means a closed chapter. Although the bile does not possess any direct power as an enzyme, it has, nevertheless, a zymosthenic or activating influence[4] in that it increases the activity of the ferments of the pancreatic juice and activates the lactase of the intestinal secretion, and has a strong stimulating influence in the formation of invertin. It augments the lypolytic power of the pancreatic juice and favors saponification and thus aids materially in the absorption of fat. Protein by-products form insoluble compounds in an acid medium, but are redissolved in an excess of bile. Although bile has no antiseptic power, per se, it aids in preventing intestinal putrefaction by favoring the development of the less active organisms and by modifying the activities of such bacteria as are present. In addition, bile probably has an antitoxic function by neutralizing certain poisons arising from intestinal putrefaction.[5] Mucin is coagulated by mucinase derived from the cells lining the intestines. Bile inhibits the action of mucinase with the result that the mucin in the upper portion of the intestinal tract is in a fluid state and undergoes coagulation only lower down in the large intestine. In normal feces, the saponified and unsaponified fats are approximately equal in amount. The pancreatic juice brings about the proper degree of fat splitting that must precede saponification so that if the excess of fat is due to a pancreatic defect, unsaponified fat will be in excess of

3. Babcock, W. W.: The Control of Hyperchlorhydria and Its Consequences by Cholecystogastrostomy, Med. Rec. **98**: 476 (Sept. 18) 1920; Cholecystogastrostomy and Cholecystoduodenostomy, Am. J. Obst. & Gynec. **1**: 854 (May) 1921.
4. Roger, H.: Universal M. Rec. **3**: 289 (April) 1913.
5. Roger, H.: Presse méd. **20**: 801 (Oct. 2) 1912.

the saponified. On the other hand, the absorption of fat is dependent on the bile salts acting on the fats already digested by the pancreatic juice. Accordingly, if there is loss of bile, saponified fats will be in excess because they cannot be adequately absorbed. It is due to this difficulty in the absorption of fat that chronic jaundice is so uniformly associated with wasting.[6] The emaciation and loss of weight are not indicative of carcinoma, as both may be present in chronic pancreatitis with obstructive jaundice.

The bile salts that enter the bowel are reabsorbed and used over again several times. Soon after a cholecystostomy has been established, the salts in the bile fall to one tenth of the normal since reabsorption cannot occur. The loss of bile externally by prolonged cholecystostomy means an exhaustion of bile salts due to the inability of reabsorption and a progressively diminishing hepatic function of the liver.

PANCREATIC CARCINOMA AND COURVOISIER GALLBLADDER

Pancreatic or ampullar carcinoma is the most rapidly fatal of any form of neoplasm. Death ensues within from seven to eight months from the time of onset of noticeable symptoms, and occurs usually before the growth metastasizes or obtains any great local extension. There is no place, with the possible exception of the central nervous system, where a neoplasm, while yet small, induces so much widespread symptomatology as at the lower end of the common duct. The clinical differentiation between cancer and chronic pancreatitis is always difficult and sometimes, even with intra-abdominal exploration, it may be impossible to distinguish between these two conditions, particularly if the pancreatitis is nodular. They are both associated with chronic obstruction of the common duct, and the persistent jaundice and distended

6. Brown, W. L.: A Clinical Lecture on Jaundice, Med. Press & Circ. **94**: 482 (Nov. 6) 1912.

Courvoisier gallbladder give a similar pathologic picture. Bevan [7] states that he has had "twenty or more of these cases, many of which were considered malignant at exploratory operation but had made complete recoveries."

Stone in the common duct is usually the result of a previous infection of the gallbladder and predicates a chronic cholecystitis with cicatrization and contracture. Courvoisier,[8] reporting 187 cases of obstruction of the common duct, found that in 100, obstruction was due to causes other than stone and in eighty-seven the obstruction was due to calculous impaction. Of the 100 cases in which obstruction was due to causes other than stone, in ninety-two there was a dilatation or distention of the gallbladder and in eight cases there was a normal gallbladder or an atrophy of the gallbladder. Of the eighty-seven cases in which obstruction was due to stone, in seventy cases the gallbladder was atrophied and in seventeen cases the gallbladder was dilated. The deduction was made by Courvoisier that in cases of chronic jaundice due to obstruction of the common duct a contraction of the gallbladder signifies that the obstruction is due to stone: a dilatation of the gallbladder that the obstruction is due to causes other than stone. Cabot,[9] reporting the cases of the Massachusetts General Hospital, found eighty-six with obstruction of the common duct. With the exception of four cases, which constituted only 5 per cent. of the total number examined, every record in which definite statements are to be found confirms Courvoisier's law.

The exceptions to Courvoisier's law are few: (1) stone in the cystic duct with hydrops or empyema and with stone in the common duct; (2) acute cholecystitis, with obstruction of the cystic duct and with a stone in the common duct; (3) chronic pancreatitis with stone

7. Bevan, A. D.: Present Status of the Surgery of the Bile Tract, Surg., Gynec. & Obst. 27: 49 (July) 1918.
8. Courvoisier: Beitrage zur Pathologie and Chirurgie der Gallenwege, Leipzig, 1890, p. 58.
9. Cabot, A. T., quoted by Moynihan, B. G. A.: The Pathology of the Living, Philadelphia, W. B. Saunders Company, 1910, p. 203.

in the common duct; (4) stone in the cystic duct with compression of the common hepatic duct, and (5) malignant disease along the course of the common duct, with an old chronic fibroid gallbladder.

It is usual to find the Courvoisier gallbladder distended with bile. This is not always the case, as a distinct hydrops and a well dilated common duct filled with clear mucoid fluid have been observed. This condition is associated with patulous cystic and hepatic ducts and is essentially a pressure acholia. In one of our cases with steadily increasing jaundice, the gallbladder and common duct were found at operation to be enormously distended with clear fluid. A cholecystostomy was performed, and for a few hours clear fluid flowed from the tube. After the mucoid material drained away, bile was obtained in large amounts. Later necropsy revealed a small carcinoma at the ampulla of Vater. Kausch [10] thinks that the hydrops in these cases is due to excessive secretion by the mucosa of the gallbladder and ducts, and, with the duodenal opening occluded, the pressure in the ductal system is so raised that the bile is forced into the blood and lymph vessels of the liver.

OPERATIVE PROCEDURES

Operations for carcinomatous jaundice will be palliative procedures to provide drainage for the biliary secretion. The simplest technic for this purpose is external drainage by means of cholecystostomy. Such an operation, however, entails a rapid loss of bile salts and body fluid and should not be the procedure of choice. The union of the gallbladder to various portions of the alimentary tract has been performed a number of times in almost all of the large clinics of the country. The union to stomach, duodenum, small intestine and colon has been variously performed for

10. Kausch: Der Hydrops des gesamten Gallensystems bei chron. Choledochus verschluss, Mitt. a. d. Grenzgeb. d. Med. u. Chir. **23**: 138, 1911. Outerbridge, G. W.: Carcinoma of the Papilla of Vater, Ann. Surg. **57**: 402 (March) 1913.

a wide variety of lesions. Theoretically, an anastomosis can be made between the gallbladder, hepatic duct, common duct and any contiguous bowel surface thus: (1) anastomosis between the gallbladder and various portions of the gastro-intestinal tract — cholecystogastrostomy, cholecystoduodenostomy, cholecystenterostomy, cholecystocolostomy: (2) anastomosis between the hepatic duct and the stomach, duodenum or a portion of the small intestine; (3) anastomosis between the common duct and the stomach, duodenum or small intestine.

The choice of a particular operation will depend on a number of factors, such as (1) the physiologic efficiency of the procedure; (2) the ease of technical accomplishment; (3) the relative immunity from ascending infection; (4) the immediate effect on the physiologic chemistry of the gastro-intestinal tract; (5) the remote effect on the patient's metabolism, and (6) the operative mortality. The classical operation of cholecystoduodenostomy will more nearly simulate the natural condition of biliary drainage than any type of operation. The technical difficulties of performing cholecystoduodenostomy with a fixed duodenum and the possibility of duodenal fistula are factors which will prevent this type of anastomosis from being accepted as a uniform surgical procedure. Moreover, the mortality of cholecystoduodenostomy is certainly greater than cholecystogastrostomy.

Technically, the union of the gallbladder and the stomach is probably more easily performed than any other form of anastomosis as the parts are naturally in close and intimate relationship, and little, if any, mobilization is necessary to bring the viscera in apposition. Cholecystenterostomy carries with it the possibilities of angulation and the necessity for a secondary entero-enterostomy to prevent kinking. The union between the colon and gallbladder is physiologically defective: (1) on account of the reflux of the

highly charged bacterial content of the colon with an almost certain degree of ascending infection; (2) the possibility of reverse mucous currents from the colon as described by Bond; (3) the loss of the digestive functions of the bile, especially in the saponification of fats; (4) the fact that the bile is soon evacuated with the stool means a rapid permanent loss of the bile salts which would be normally reabsorbed from the intestines, to say nothing of the profound changes that would be induced by the lack of bile in duodenum to neutralize the acid chyme. The union of the gallbladder to the colon can be summarily dismissed as being the least desirable of all forms of anastomotic surgery.

A review of the experimental and clinical evidences found in the literature pertaining to gastrobiliary fistula or cholecystogastrostomy demonstrates not only that the anastomosis is rational but also that it has advantages distinctly superior to any other method of anastomosis of gallbladder to any portion of the gastro-intestinal tract. The advantages of the union of the gallbladder to the stomach may be summarized thus: (1) A close anatomic apposition of the two viscera is easily accomplished; (2) the delivery of bile into the gastro-intestinal tract at an approximately normal point; (3) the facility of visceral mobilization and the ease of technical performance by reason of the fact that the anastomosis is between two viscera of fairly well developed size and thickness; (4) the adequate sterilizing mechanism of the stomach prevents ascending infection together with the known absence of infection in operations on the stomach and gallbladder,[11] and (5) minimal mortality.

Physiologically considered, there is no objection to the presence of bile in the stomach as has been demonstrated so often clinically and proved by experiments on animals.

11. Deaver, J. B.: Surgery of the Upper Abdomen, Philadelphia, P. Blakiston's Sons & Co., 1921, p. 41.

In an experimental study by Grey,[12] in which cholecystogastrostomy was performed with complete division of the common duct, it was demonstrated that on a diet of meat and water, with bile constantly present in the stomach throughout the course of digestion, there was no appreciable effect on the acidity of the gastric content. Postmortem examination showed a functioning union, and the gastric mucosa showed no pathologic changes.

The presence of bile in the stomach produces no directly harmful influences. It is found constantly after gastro-enterostomy, and the Polya operation and its regurgitation with the various tests for pancreatic and biliary function suggests that it is tolerated by the stomach with impunity. At the completion of gastric digestion, duodenal contents flow back into the stomach through the relaxed pylorus.[13] In animals that have been fasting, intestinal juice will continuously run out of a gastric fistula. Rehfuss [14] found bile in the fasting stomachs of most of the normal students examined. Contrary to the usual conception, the normal reaction in the pyloric end of the stomach is actually alkaline, the hydrochloric acid being secreted mainly by the glands of the proximal two thirds; and it would seem that in the inactive or resting phase of the stomach bile is constantly present in the antrum.[15] If the alkalization of the stomach is the chemical means for the cure of gastric ulcer—a view taken by many surgeons—then there can be no valid objection to a technical procedure which will deliver the biliary current just proximate to the pyloric ring by a cholecystogastrostomy.

For performing a cholecystogastrostomy, it is necessary to have a gallbladder with a patulous cystic duct,

12. Grey, E. G.: An Experimental Study of the Effect of Cholecystogastrostomy on Gastric Acidity, J. Exper. Med. **23**: 15-24, 1916.
13. Alvarez, W. C.: The Motor Functions of the Intestine from a New Point of View, J. A. M. A. **65**: 388 (July 31) 1915.
14. Rehfuss, M. E.; Bergeim, Olaf, and Hawk, P. B.: The Question of the Residuum Found in the Empty Stomach, J. A. M. A. **63**: 11 (July 4) 1914.
15. Hertz, A. F.: The Sensibility of the Alimentary Canal, London, Oxford Press, 1911, p. 58.

with relatively normal walls, or not too seriously diseased in order that the gallbladder and cystic duct may properly function as a delivery tube from the common hepatic duct to the stomach. After union of the gallbladder with the stomach, the gallbladder probably contracts and elongates into a small tubular channel. Roentgen-ray studies in cases in which cholecystogastrostomy has been performed showed that bismuth or barium do not enter the gallbladder.[16] In functional determination of the gastric acidity after cholecystogastrostomy, the amount of free acid is not less than the normal amount, although there is a varying diminution in the total acidity.

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ABSTRACT OF DISCUSSION

DR. JOHN B. DEAVER, Philadelphia: I am inclined to attribute the emaciation sometimes associated with jaundice to the toxic effect of the bile in the blood rather than to the difficulty in the absorption of fats. What proof is there that the loss of bile per se is harmful? In the treatment of chronic, as well as in some cases of subacute, pancreatitis, associated with disease of the gallbladder or bile ducts, patients do just as well where bile drainage has been done to the outside through a tube in the gallbladder or in the common duct. True, these patients have to wear a bottle, in the case of women in a little pocket made in the corset, and in men in the underwear. My patients who are discharged wearing T tubes wear the tube from nine months to two years, and even as long as four years, with perfect comfort, and what is more, perfect well being. Cholecystogastrostomy versus cholecystoduodenostomy is more or less a Hobson's choice. Both are procedures that should be used only in comparatively few cases. That the gastric anastomosis is easier than the duodenal may be true, but it scarcely is an argument in its favor. However, I question whether one who cannot trust himself to do the latter should do the former. The duodenum may, perhaps, not always be accessible, and in such instances gastric anastomosis can be made. With few exceptions, I mobilize the duodenum, which enables me to bring it up well enough to make this anastomosis without difficulty. Cholecystoduodenostomy is certainly the more logical operation because it is the more

16. Jacobson, J. H.: Anastomosis of the Gallbladder to the Stomach: "Cholecystogastrostomy," Am. J. Obst. and Dis. Wom. and Chil. **70**, 1914.

physiologic one. But in either operation, in the absence of complete obstruction of the common duct, these openings close sooner or later. I have demonstrated this in a number of instances in which I have reoperated six or eight months afterward. When I do a choledochostomy I often close off the tube two or three times a day for a short time, convalescence being well established. In pancreatic or other cases in which patients are discharged with the T tube in place, they are instructed to clamp it off occasionally with the hope that the bile itself will get in the intestine. I certainly would not advocate the operation of cholecystogastrostomy in the treatment of ulcer. Considering the good results obtained in the treatment of gastric ulcer by excision of the ulcer, combined with posterior gastro-enterostomy, or by partial gastrectomy, it certainly does not seem justifiable to use so extreme and unphysiologic an operation as cholecystogastrostomy for these ulcers.

Dr. E. Starr Judd, Rochester, Minn.: There is no question that many patients are cured by cholecystostomy or choledochostomy. One point is sometimes overlooked: In anastomosing the fundus of the gallbladder and the intestine, the bile will not drain through the anastomosis unless there is practically a complete obstruction of the common duct. We have found cholecystogastrostomy in cases of complete jaundice more satisfactory than cholecystoduodenostomy, although, when the latter can be done as easily, we still employ it in some cases. We should continually bear in mind that in some of these cases the lesion is a carcinoma of the head of the pancreas, and that in others it may be a chronic pancreatitis. This emphasizes the point Dr. Heyd brought out, that, under ordinary circumstances, these cases of painless jaundice should be explored. Considerable work is being done on preliminary treatment in jaundice cases. The risk from hemorrhage after operating in jaundice cases is being reduced considerably by the intravenous administration of calcium and by repeated transfusions.

Dr. Moses Behrend, Philadelphia: There is no question that the operation of cholecystogastrostomy has been performed for conditions for which it should not be done: for instance, gastric ulcer. Whenever we can we ought to anastomose the gallbladder and the duodenum. That is true. But there are conditions in which it is impossible to bring up the duodenum to the stomach. Therefore, the proper thing to do is to anastomose the gallbladder to the stomach. Patients may vomit for from twelve to twenty-four hours after the operation, but following that they are comfortable, and free from symptoms. Our anastomotic openings have stayed patulous and have given the greatest relief. If I wanted to have this operation performed and were to choose between external and internal drainage, I would much prefer an internal drainage operation. I believe there is less dis-

comfort with internal drainage than with external drainage. We cannot always tell whether there is carcinoma at the head of the pancreas. I operated on a patient three years after Dr. Deaver performed a cholecystectomy for cholelithiasis. I drained the common duct for about six months with a T tube. The patient was apparently well for two and a half years. Then she began to have symptoms again of pancreatitis. I thought she had carcinoma of the pancreas and performed a choledochogastrostomy. This patient has been well for seven months with absolute relief of jaundice and pain. It is an operation that can be recommended, and I sincerely hope it will be performed many times hereafter.

DR. JOHN J. GILBRIDE, Philadelphia: Dr. Heyd has given you Courvoisier's law, which is that there is a dilated gallbladder under certain conditions and a contracted gallbladder under other conditions. Therefore, the appellation "Courvoisier's gallbladder" is not a good one. In all these cases of anastomosis of the biliary passages with the gastrointestinal tract there is more or less continuous drainage of bile. This is also true after cholecystectomy. I occasionally see cases of cholecystectomy with regurgitation of bile, especially those cases in which there are many adhesions. Attacks of vomiting and various other gastric disturbances continue off and on for weeks at a time. We should not anastomose the gallbladder to the stomach for gastric ulcer. If bile does any good for gastric ulcer it should be effective in duodenal ulcer below the papilla of Vater. It evidently is not. We all agree with Dr. Heyd as to the advisability of operating in cases of chronic jaundice because of the possibility of error in the diagnosis. The ideal operation is anastomosis of the gallbladder with the duodenum. Occasionally one sees a duodenum whose walls are so soft as not to hold the suture. In four cases of chronic jaundice due to malignant disease of the head of the pancreas that I have seen there was no itching. The first case of this kind came under my observation in 1905, and I was impressed by the absence of scratch marks on the body, although the patient was deeply jaundiced. Therefore, it occurred to me that there might be a difference, aside from color, between the jaundice caused by malignant disease and the jaundice of nonmalignant disease. Physiologists teach that the itching associated with jaundice is due to one of the bile salts. I have thought that the itching is due to infection. If that is true, there would be an absence of itching in jaundice from any cause when not associated with infection.

DR. CHARLES GORDON HEYD, New York: If nature intended bile to be excreted, she would have devised an apparatus to perform this function as she does with the urinary system. Again, bile is delivered at the first portion of the small intestine where absorption takes place. Furthermore, we know that after cholecystostomy the amount of bile salts in

the bile diminishes to one-tenth the normal amount and there is a condition of exhaustion due to the too rapid loss of bile salts, as Gerster brought out when he urged the feeding of cholecystomized patients with their own biliary discharge. Dr. Deaver states that he clamps off the tube in his cases periodically to prevent the too rapid loss of bile. In chronic pancreatitis it does not matter whether you drain internally or externally. I was advocating this operation primarily for permanent occlusive processes of the common duct; I did not intend to "ride" the operation as a cure for gastric ulcer. As to the apparent contradiction pointed out by Dr. Deaver as to not diminishing the acidity of the gastric contents by cholecystogastrostomy I would draw attention to the fact that the normal reaction at the terminal or antral portion of the stomach is alkaline, and that an alkaline fluid at the outlet of the stomach does not necessarily interfere with acidification or acid digestion in the proximate two thirds of the stomach.

BLOOD PRESSURE CHANGES DURING ABDOMINAL OPERATIONS

ALEXIUS McGLANNAN, M.D.
BALTIMORE

Operation in the early stage of disease, when the pathologic process is limited to an accessible primary focus, is simple for the surgeon and safe for the patient. As the disease process invades additional areas and organs, or when the condition involves inaccessible structures, the operation becomes more difficult and the safety of the patient correspondingly less secure.

To safeguard the patient through one of these difficult operations, many procedures have been devised. Preliminary treatment may offset a known handicap. Psychic control will relieve the patient of fear and anxiety. Special forms of anesthesia and particular methods of operating will diminish the shock of the procedure. The recognition of the advent of shock will enable the surgeon to arrange for its prompt treatment and to modify his procedure so as to limit its development. The performance of multiple stage operations has added greatly to the safety of the patient in carrying out extensive manipulations.

There is a constant relation between falling blood pressure and the condition of shock. A knowledge of variations in the blood pressure of the patient during operation will enable the surgeon to decide on the safety of continuing his manipulations, or the necessity for limiting them.

Many factors developing in the course of an operation contribute to alterations in the blood pressure, either increasing or diminishing it. Studying the

changes which occur in relatively simple operations, we obtain knowledge which becomes most valuable when we are called on to safeguard a handicapped patient through a severe operation. Practically all of the changes in blood pressure noted in our records have been predicted or actually observed by investigators studying shock through animal experimentation. Furthermore, this similarity has allowed us to make accurate use of the various means for the prevention and cure of shock which have been the result of these animal experiments.

TABLE 1.—HERNIA OPERATION

		Primary Effect			Excision of Sac			Closure		
Anesthetic	Cases	Rise	Fall	No Change	Rise	Fall	No Change	Rise	Fall	No Change
Nitrous oxid and procain	10	10	0	0	1	4	5	3	0	7
Ether.....	12	3	4	5	0	9	3	6	2	4
Procain.....	18	2	4	12	1	7	10	7	2	9

This paper is based on a study of the blood pressure records kept during the course of 394 abdominal operations performed by the members of the Staff of St. Agnes' Hospital, Baltimore. The systematic recording of the blood pressure during operation was introduced in the clinic several years ago by Dr. J. C. Bloodgood, and such a record is kept as a routine procedure in all our operations. The systolic pressure is measured by means of a spring instrument.

A simple hernia occurring in an otherwise healthy young adult gives us an opportunity for studying the effects of surgical operation on the blood pressure without complicating factors. Forty such cases were studied (Table 1 and Chart 1).

THE EFFECT OF ANESTHETICS

Nitrous oxid and oxygen with procain infiltration usually caused a rise of from 10 to 30 points in pressure. As a rule, this higher pressure continued throughout the operation. Ether, on the other hand, seldom caused a rise, and about as often caused a fall

in pressure. In about one half of the ether cases there was no primary change; and the primary rise, when it did occur, was never sustained throughout the operation. When the operation was performed under local anesthesia, the pressure in the majority of cases remained unchanged.

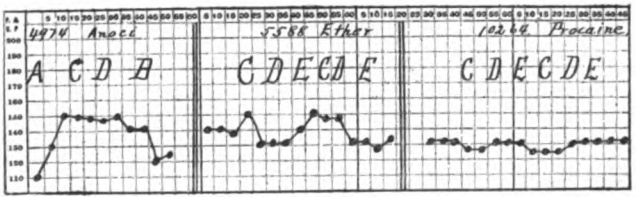

Chart 1.—Blood pressure changes during operations for hernia: *A*, gas started; *B*, gas stopped; *C*, sac opened; *D*, sac closed; *E*, muscle suture.

EFFECT OF MANIPULATIONS

Changes in the blood pressure which occur during the excision of the sac are the result of traumatizing the parietal peritoneum, that is, the effect of irritation of sensory nerves on the vasomotor system. In 60 per cent. of the cases in which general anesthesia was used, the manipulation was accompanied by a fall in pressure. In one case, however, there was a short rise. The fall in pressure was most often noticed in patients anesthetized with ether. Operation under procain or procain-nitrous oxid (anociassociation) was without change of pressure in 50 per cent. of cases.

ACUTE APPENDICITIS

In fifty cases of uncomplicated acute appendicitis, there were twenty-two ether anesthesias and twenty-eight gas and procain (Table 2 and Chart 2). After the operation had begun, the anesthetic was changed from gas to ether in six cases. As a rule, the change was made in order to obtain better relaxation of the abdominal wall for exploration. Opening the peritoneal cavity caused some change in the blood pressure in

thirty-five of the fifty cases. There was a rise in eight of the gas and in five of the ether group, and a fall in eight gas and in fourteen ether cases.

TABLE 2.—ACUTE APPENDICITIS

Anesthetic	Cases	Opening Peritoneum			Manipulation			Closure			Compensation With Closure	
		Rise	Fall	No Change	Rise	Fall	No Change	Rise	Fall	No Change	Rise	Fall
Nitrous oxid and procain	22	8	8	6	11	8	3	5	8	9	5	8
Ether	28	5	14	9	6	10	12	8	10	10	5	5

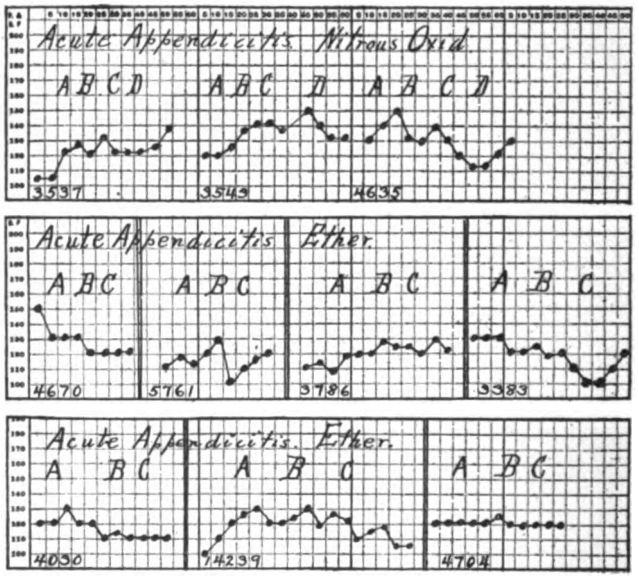

Chart 2.—Blood pressure changes during operations for acute appendicitis: *A*, peritoneum open; *B* (Cases 3537, 3543, 4635), manipulation; *B* (other cases), appendix delivered; *C* (Cases 3537, 3543, 4635), appendix out; *C* (other cases), peritoneum closed; *D*, peritoneum closed.

Similarly, there was a pronounced effect from manipulations incident to the delivery of the appendix (packing, traction, etc.). During the closure of the wound, a change in pressure occurred in thirteen gas

and eighteen ether cases. In five gas cases there was a rise in pressure at this time, which compensated for a previous fall, while there were eight cases in which a fall brought the pressure back to the preoperative level. With ether, in five of the ten cases, the fall at this stage of the operation balanced a previous rise, but in the other five cases the fall continued an already existing drop in pressure. In five of the ether cases the earlier drop was followed by a rise during the closure of the wound.

TABLE 3.—APPENDICITIS WITH PERITONITIS

		Opening Peritoneum			Manipulation*			Closure			Compensation With Closure	
Anesthetic	Cases	Rise	Fall	No Change	Rise	Fall	No Change	Rise	Fall	No Change	Rise	Fall
Nitrous oxid and procain.....	17	8	2	7	2	3	7	0	6	6	0	2
Ether.....	19	5	6	8	8	13	3	2	10	12	2	2

* In five cases the anesthetic was changed to ether at this stage.

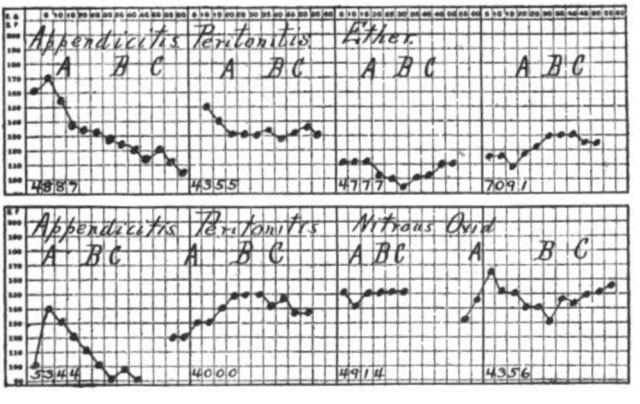

Chart 3.—Blood pressure changes during operations for appendicitis and peritonitis: *A*, peritoneum open; *B*, appendix out; *C*, drains in place; closure begun.

When appendicitis was complicated by peritonitis (Table 3 and Chart 3) the sensitiveness to anesthetics as well as to peritoneal manipulations was increased 50

per cent.; that is, in the peritonitis series the number of patients showing a blood pressure response to these stimuli was increased in this proportion over the number showing a response in the uncomplicated series.

The reaction to opening the peritoneum was very slightly altered in character, but the manipulations produced marked lowering of the pressure in most cases. This fall was more marked under ether than in the cases in which gas was used for anesthesia. The recovery incident to suspension of manipulations and occurring during closure of the wound was materially diminished. A rally was noted in a proportion of but one to five cases as compared with the uncomplicated series.

OPERATIONS ON THE GALLBLADDER

In general, the blood pressure changes during gallbladder operations resembled those occurring during the operations on the appendix (Table 4).

TABLE 4.—RELATIVE FREQUENCY OF BLOOD PRESSURE RESPONSE AND FALL DURING OPERATIONS ON THE APPENDIX AND GALLBLADDER

Operation	Cases	Response, per Cent.	Fall in Pressure, per Cent.	Compensation With Closure, per Cent.
Appendectomy.....	50	70	36	46
Cholecystostomy.....	30	60	45	23
Cholecystectomy.....	15	65	60	14

The manipulations in the upper quadrant produced a more frequent fall in pressure than those made in the lower portion of the abdomen. For example, in uncomplicated appendicitis, the manipulations incident to removal of the appendix brought out a blood pressure change in 70 per cent. of the cases, with a fall in the pressure in 36 per cent. With cholecystostomy the response occurred in 60 per cent., with a fall in 45 per cent. of the cases. Cholecystectomy was associated with a response in 65 per cent of the cases, and in 60 per cent. this change was a fall in pressure. In two cases in

which an impacted stone was removed from the common duct, the pressure was greatly affected by the manipulations.

The combination of oozing, difficult manipulations and long standing infection led to shock in the case of a jaundiced woman with a common duct stone covered in by adhesions between the omentum, gallbladder and neighboring viscera (Chart 4).

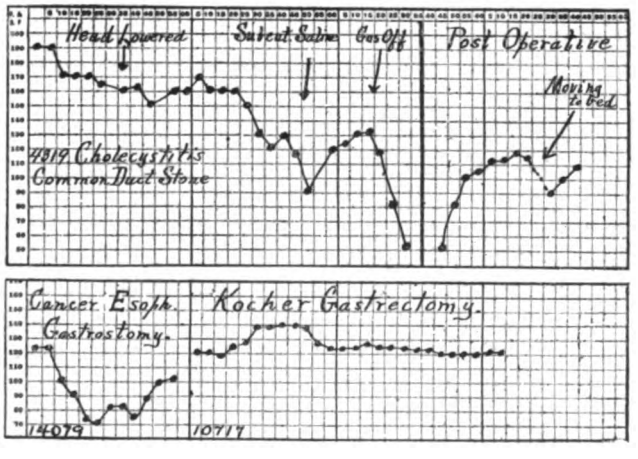

Chart 4.—Blood pressure changes in choledocostomy with shock, in gastrostomy and in pylorectomy.

OPERATIONS ON THE STOMACH

Gastrostomy.—In two cases the Ssabanajew-Franck operation was performed on account of malignant obstruction. The blood pressure fell rapidly as the peritoneal cavity was opened (Chart 4). The fall may be explained in part by the escape of fluid from the peritoneal cavity, but the great change shows the sensitiveness of the starved and cachectic patient. Gastrostomy should be done under infiltration anesthesia before the patient has become exhausted by his disease.

Transfusion preliminary to operation no doubt would increase the patient's resistance to the effect of the manipulations.

Pylorectomy for benign or malignant stenosis was done four times. In three the Kocher method was used, and in the fourth the Polya.

Pyloroplasty.—In four cases the Finney operation was performed. There was little or no change in the blood pressure, during this operation.

Gastro-Enterostomy.—The posterior operation was done eight times, and the anterior once in the series. There was some reaction as the stomach and jejunum were isolated and brought up for suture. In the ulcer cases this was slight, but in a cancer case the fall was considerable.

HYSTERECTOMY

In spite of the fact that the operation requires a longer time for its completion and that the organ removed is so much larger, hysterectomy gave rise to blood pressure changes almost the same as those noted in appendectomy. The hysterectomy patients showed a more frequent fall in pressure as the peritoneal cavity was opened, but practically no difference in the response to manipulations. On the other hand, after hysterectomy, there was very little tendency for a compensatory change in the blood pressure to take place during closure (Table 5).

TABLE 5.—COMPARISON OF BLOOD PRESSURE CHANGES DURING APPENDECTOMY AND HYSTERECTOMY

		Opening Peritoneum		Manipulations		Compensation With Closure, per Cent.
Operation	Cases	Response, per Cent.	Fall, per Cent.	Response, per Cent.	Fall per Cent.	
Appendectomy.....	50	70	44	70	36	46
Hysterectomy.....	32	60	47	70	35	7

When the operation was performed for the cure of inflammatory disease, the relations were more marked than in the cases of tumor. The varying effects of operation for myoma, for inflammatory disease and for early cancer are shown in Chart 5. In one case, cholecystostomy was done after the uterus had been

removed. There had been a fall in pressure during the ligation of the vessels and covering in of the raw area of peritoneum, from which the patient had rallied. The uterus was removed in thirty-five minutes; the ligations and the peritoneal suture required twenty minutes.

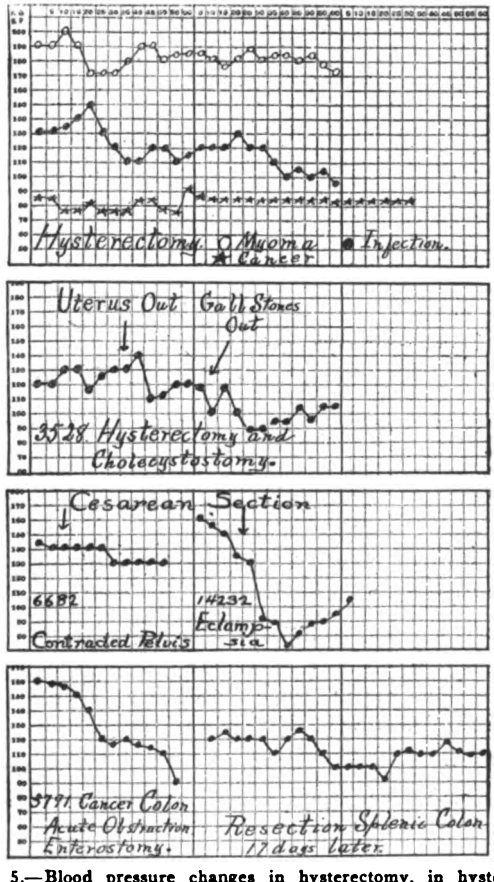

Chart 5.—Blood pressure changes in hysterectomy, in hysterectomy with cholecystostomy, in cesarean section and in cancer of the colon.

When the second incision to expose the gallbladder was made, at sixty minutes, the pressure fell and continued to fall during the fifty minutes required to complete the operation. The effect of the additional trauma of the

upper quadrant manipulation shows the cumulative increase in sensitiveness of the vasomotor system during a severe operation (Chart 5).

During operation for salpingitis and for the removal of ovarian cysts, the blood pressure followed closely the series of changes noted during hysterectomy. Acute inflammatory disease increased the sensitiveness of the patient to all manipulations.

When vaginal and abdominal operations were combined, as, for example, repair of a lacerated perineum with uterine suspension, there was a frequent fall in pressure after the patient was changed from the lithotomy to the Trendelenburg position.

Cesarean section performed because of contracted pelvis was done without any great change in the pressure; but when the operation was required because of eclampsia, the fall in pressure as the uterus was emptied was a great one (Chart 5).

RESECTION OF THE COLON

When this operation is performed for the removal of carcinoma of the colon, the value of the two stage procedure is generally admitted. Under any circumstances the excision of so important an organ with the necessary manipulation of vessels and nerves is associated with considerable change in the blood pressure. When the patient comes to the surgeon already debilitated by a malignant tumor, added to in many cases by intestinal obstruction of varying degrees of completeness, the reaction to operation, as shown by the blood pressure, is greatly intensified.

Many of the cancers of the colon belong to a group of tumors in which the local growth is extensive, but in which metastasis occurs late. These secondary growths are arrested for a considerable time in the adjacent lymphatic glands. For this reason a wide local excision, if it can be done successfully, offers an unusually good chance for cure of the patient. In this

group of cases an acute intestinal obstruction is often the first symptom. At the operation required by the obstruction the tumor can be explored, but its removal should never be attempted. Enterostomy well above the seat of obstruction and on the opposite side of the abdomen should be done as a preliminary step. Almost always the blood pressure falls as the tension is relieved by the enterostomy (Chart 5). The fall persists for several hours and is a warning against prolongation of the operation.

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ABSTRACT OF DISCUSSION

DR. BERTRAM M. BERNHEIM, Baltimore: This paper illustrates once more the extreme advisability of surgeons taking advantage of clinical aids of known worth. Physicians, generally, have long emphasized the value of blood pressure readings, but surgeons have neglected their opportunities. They pay too much attention to new operations. It must be apparent to even the most skeptical that blood pressure readings, properly made, during the course of an operation, offer a factor of safety second to none and only too often sorely needed. Dr. McGlannan has only scratched the surface. However, his charts illustrate the practical observations of the anesthetist during the course of operation. Would it not, perhaps, be possible by means of blood pressure studies to determine the psychologic time for operation in certain states, such as, for example, exophthalmic goiter, much in the way that basal metabolism studies are supposed to do now? Would it not be possible, by intensive blood pressure studies, to differentiate between certain states of shock, such as, for example, an intra-abdominal hemorrhage and a peritonitis of unknown origin? I have devoted myself to studies of this character for many years and have always used the blood pressure apparatus. I realize now that I have not reaped the benefit from this diagnostic means that I should have, merely because there was little or no correlation between blood pressure findings in hemorrhage and blood pressure findings in surgical conditions in general.

RELATION BETWEEN THE THYROID GLAND AND THE FEMALE GENITAL ORGANS, PARTICULARLY THE OVARIES*

ADDISON BRENIZER, M.D.
CHARLOTTE, N. C.

The actions of the separate internal secretions are not independent, but they are correlated and collective and represent only a proportionate effect of the whole endocrine system. The object of this paper is to point out and stress the relationship between the thyroid gland and the ovaries, based on the preponderating effect of the one gland on the other. The pathologic and experimental data pointing to this relationship, though abundant, are mostly confused and unproved, and will likely remain speculative; certainly, until we can have in hand pure organ extracts, like Kendall's thyroxin, and be able to study their respective pharmacologic actions.

Particularly when the relationship involves more definitely the thyroid gland in hyperthyroidism and hypothyroidism, oxidation processes and their influence on general metabolism, which in reality do subserve the necessities of the glands involved, must be given the closest consideration.

Clinically, through the pictures of the so-called classical endocrine syndromes are discernible in the tracings of these pictures lines in more or less light and prominence, marking the effects of other endocrine glandular activities. It is then not surprising that orientation

* This contribution is based upon the analysis of 415 cases observed and operated upon by the author, supported by a review of the literature for the past ten years.

in the presentation of simple glandular interrelationships is difficult.

Ductless gland disturbances may manifest themselves clinically without gross pathologic changes and, perhaps, without a histopathology; but in a considerable proportion of cases there can be found actual pathologic entities. In order to show, more positively, the interrelationship of the ovaries in affections of the thyroid gland, actual pathologic change in both glands should be demonstrated. Though this be the criterion, and although this criterion can be satisfied in some cases, still the opportunity has not been given, nor has the work been done with the ovary as with the thyroid gland, to prove the close association of pathologic structure to clinical syndromes. We must, therefore, depend in large part on gross pathologic findings, revealed on physical examination, verified by operation and less frequently by necropsy.

Freund of Strassburg reported that, without exception, he was able to demonstrate chronic atrophic parametritis in all cases of exophthalmic goiter examined by him. Blocq offered a case in which exophthalmic goiter was cured after double oophorectomy; Eastman cited a case of hyperthyroidism relieved by the removal of a fibrocystic ovary and the tube. On the other hand, Matthieus mentioned a case in which exophthalmic goiter developed after removal of the ovaries; Vinay and others have pointed out that exophthalmic goiter may appear after spontaneous or operative menopause. Chrustalew performed seven necropsies on exophthalmic goiter patients and found cystic and fibrocystic ovaries in all of them. Tilmant described a family in which there were six women who showed symptoms of exophthalmic goiter, developing as the menopause because installed or the ovaries became insufficient from other causes. Lampe, using the Abderhalden reaction, found, in exophthalmic goiter cases, ferments against the ovaries, thyroid and thymus;

this would point to some defect in ovarian secretion. In long standing and severe cases of exophthalmic goiter, there was occasional atrophy of the entire genitalia, suggesting a marked hypofunction of the ovaries. Out of 15,000 women seen in the Maternity at Edinburgh by Halliday-Croom, one case of exophthalmic goiter was found; similarly, Bonnaire reported two cases out of 30,000 pregnancies reviewed by him. Sterility, per se, certainly is a hypofunctional condition of the genitals because the main reason for the tract is the function of reproduction.

Four of my exophthalmic goiter patients had already been operated on for ovarian cysts; and one operated on for exophthalmic goiter later had a large ovarian cyst removed. One patient was of particular interest, in that she developed an acute and fulminating exophthalmic goiter just five days following the removal of an ovarian cyst along with the ovary, and she showed rapidly, in the course of the next two weeks, a marked enlargement of the thyroid gland, a pulse of 190 and a very prominent exophthalmos. She did not improve until thyroidectomized five months later. I have, likewise, found five cystic or fibrocystic ovaries in goiters of adolescent patients who gave a pelvic complaint sufficient to justify an examination.

The enlargement of the thyroid at puberty, before menstruation, during pregnancy and at the menopause, is a mild hypertrophy and hyperplasia; there is an increase in the size of the cells of the acinus with a moderate amount of alveolar infolding, with sometimes an increase, sometimes a decrease in the amount of the colloid present, dependent, likely, on the amount of iodin circulating through the thyroid to mobilize the colloid.

As stated by Marine, it is probable that the same chemical disturbances initiate the thyroid change both in sexual activity and in goiter, the difference being one of degree. It is, therefore, to be inferred that the

initiating cause lies in the ovaries, owing likely to their failure to adequately meet the demands made on them at the time.

As argued by Hoppe, it is quite agreed that the chief function of the thyroid is the regulation of protein metabolism, and this is done, perhaps, by its acceleratory catabolic and dissimilatory hormone, while the retarding hormones of the ovaries build up and stimulate assimilation.

The thyroid is made up of a single secretory unit, the acinus, whereas the ovary embraces at least two secretory units, the corpus luteum and the interstitial gland. Ochoterena and Ramirez have thrown some light on the functions of these two constituents of the ovary and conclude:

> The secretion of the corpus luteum being antagonistic to that of the interstitial cells, when the corpus luteum retrogresses or is experimentally suppressed, the action of the secretion of the interstitial cells is manifested. This latter secretion is the determining factor of menstruation; during the menstrual period the corpus luteum is either nonexistent or in a regressive phase, while the interstitial cells manifest with maximum intensity the secretory phenomena. The ovarian congestion, which coexists with menstruation, favors the maturation of the graafian follicle. This ruptures and gives rise to a new corpus luteum, which, in its turn, depresses the secretion of the interstitial cells, thereby causing discontinuance of menstruation, and thus initiates the cycle previously described.

If these conclusions be accepted, it is highly suggestive that the secretion of the corpus luteum itself normally inhibits the thyroid, or neutralizes the effect of the interstitial cells, which, in their turn, may activate the thyroid. It must not be supposed, however, that these actions of the secretions are directed without an intermediary phase on the secretory units themselves, but more probably through metabolic processes, which are influenced by the secretions to subserve the necessities of the thyroid and the ovary. In support of this theory, we have the enlargement and overactivity of the thyroid at puberty, when there is no corpus

luteum; again, before and during menstruation, when the corpus luteum is nonexistent or suppressed; again, during pregnancy, when the corpus luteum does not adequately meet the demands of the condition, particularly in its rôle in relation to the mobilization of the products of protein metabolism; and finally, at the menopause, when the corpus luteum ceases to be.

The inhibiting effect of the corpus luteum, on the one hand, and the activating effect of the interstitial cells, on the other, may explain, at least in part, the conflicting observations of various authors. Berkeley, thirteen years ago, claimed that the corpus luteum was of decided value in early and mild cases of hyperthyroidism, in the beginning of treatment, and that it was an antidote to thyroid intoxication. Hoppe, last October, remarked that the administration of corpus luteum will not cause a deficient ovary to produce a mature graafian follicle, but that corpus luteum will improve the condition of the patient and keep her in fairly normal condition in cases of exophthalmic goiter. On the other hand, the experiments of Hallion would prove that ovarian extracts cause vasodilatation within the thyroid and consequent overactivity, and the results of treating the ovaries with roentgen rays and radium would point to amelioration of hyperthyroidism by reducing an overactive ovary. But we know neither whether the ovarian extracts contain a preponderance of corpus luteum or interstitial cells, nor whether roentgen rays are destroying interstitial cells alone in an ovary in which the follicular apparatus is already degenerated.

There is no conclusive evidence of a hyperfunction of the ovary except on the genital tract itself. Tumors of the ovary, per se, may cause early maturity, with regression after removal of the tumor. Such cases have been cited by Frank and Barker.

It is, however, through the ovaries and, perhaps, through the corpus luteum, that all the other ductless

glands exert their influence on the structure and functions of the female generative organs. The development of the exophthalmic goiter complex may be the result of the degeneration of the graafian follicle, which does not reach maturity and burst, but undergoes liquefaction; therefore, the corpus luteum is not formed— hence a probable origin of the cystic ovaries and ovarian cysts.

According to Bell, the removal of the thyroid gland alone produces an intense degree of atrophy in the uterus. The ovaries, however, do not retrogress; on the contrary, there appears to be increased activity, especially in the follicles.

Infiltration is the chief lesion of thyroid deficiency. All the tissues and organs are infiltrated with fat and mucin, including the involuntary muscle cells and the connective tissue surrounding and permeating the glands themselves.

When their oxidation processes are improved, myxedematous patients have children. Halstead has shown that partial extirpation of the thyroid does not prevent normal pregnancy; Kirk observed one myxedematous woman with thirteen children and another with eight in the course of the disease. Hunn and Prudden counted 300 children and only twenty-nine miscarriages among sixty-four women who suffered from myxedema.

Profuse menstrual bleeding is often seen in myxedema and milder hypothyroidism, caused probably by by the infiltration of the uterine mucosa and by the defective contractility of the uterine muscle cells. The beneficial results of thyroid extract, as shown by the cases reported by Salzman, may be explained by the ridding of the uterus of its infiltrated fat and mucin, and consequently there is increased contractility of the musculature, by the catabolic action of thyroxin.

The extremes of amenorhea, menorhagia and irregularity of menstruation in exophthalmic goiter patients

may be explained, not so much by the condition of the ovary and oversecretion of the thyroid, as, on the one hand, by the diminished coagulability of the blood, and, on the other hand, by the depletion in these cases. Improvement, here, lies in the amelioration of general body conditions by the reduction of the thyroid toxemia.

CONCLUSIONS

1. Cystic, fibrocystic ovaries and ovarian cysts are not infrequently found in association with hyperthyroidism.

2. At puberty, menstruation and the menopause, and during pregnancy, the thyroid works parallel with the corpus luteum. When the thyroid is enlarged, we assume that the corpus luteum is inadequate.

3. The pelvic conditions, whatever they may be, associated with hyperthyroidism are in the nature of hypo-ovaria. The percentage of sterility in these cases is high.

4. Thyroidectomy will not cure a cystic ovary, but it may restore the generative function. We may assume this to be due to the reduction of thyroid toxemia.

5. The assumption that an endocrine balance is restored in hyperthyroidism by oophorectomy is not warranted. Conservative operations tending to establish efficient ovarian functions may favorably influence hyperthyroidism.

6. In myxedema there appears to be an increased activity of the ovaries, especially in the follicles, except so far as these glands are compressed by fat and mucin infiltration. The uterus, along with the other tissues, is infiltrated with fat and mucin.

7. The percentage of sterility in myxedematous and hypothyroid cases is fairly low. When oxidation processes of the patient are increased by the administration of thyroxin, the generative organs may function normally.

Charlotte Sanatorium.

ABSTRACT OF DISCUSSION

DR. E. STARR JUDD, Rochester, Minn.: Since the discovery of thyroxin, the function of the thyroid is better understood. Because we do not know the active principle of the ovarian extract, the function of the ovary is not well understood. There are cases, however, that would seem to suggest there is a definite relationship between the thyroid and ovarian function. One group occurs in women between 20 and 40 years of age, presenting themselves usually because of irregular and scanty menstruation. Often menstruation ceases entirely. It is not unusual for these women to put on a good deal of weight. Physical examination usually does not reveal anything. The blood presure may be a little low, 110 systolic; 80 diastolic. Examination of the sella turcica does not reveal any pathologic condition. They usually complain of having lost their pep, enthusiasm entirely gone, and they feel worn out. The natural thing to do would be to put them on corpus luteum. We have done that in a number of instances, giving large doses, as large as 40 grains a day, over quite a period of time without any apparent change. Now we give them thyroxin. They lose the excessive weight, often begin to menstruate, and become quite normal again. They certainly are not definitely cases of disturbed thyroid function. Whether thyroxin has something to do with stimulating ovarian function remains to be seen. Dr. Brenizer mentioned cases of intense hypothyroidism or myxedema. Dr. Plummer has had two interesting cases of myxedema. One was a woman 40 years of age, with a metabolism of minus 38 or 39; the other patient was a woman, 35 years of age, with a metabolic rate of minus 37. Both these women recovered under thyroxin administration and both became pregnant and bore healthy children. One point Dr. Brenizer did not touch on especially—pregnancy in association with toxic goiters. It has been quite a problem as to just how these cases should be handled. In some of the cases the toxemia is increased a great deal. The women become very toxic. Some miscarry. Others have a stormy time for two or three months and then the toxemia seems to subside; and after confinement there may be an absolute subsidence of all toxic features. We have established the rule that these patients should not be operated on during pregnancy. In reviewing a series of 1,500 goiter cases, we found that forty-one women had previously been operated on for some form of pelvic tumor. One hundred who presented themselves for treatment on account of goiter had pelvic tumor of some sort or other. We were unable to discover any relationship between the enlargement in the thyroid and the tumor in the ovary or uterus.

DR. EMIL NOVAK, Baltimore: Dr. Brenizer has offered abundant evidence that the thyroid gland has an intimate association with the ovary under both physiologic and path-

ologic conditions. It would seem unwise, however, to go into any great detail as to the exact nature of this relationship, as we know so little as to the real nature of the ovarian hormones. It is a mere matter of speculation as to whether the thyroid association concerns the secretion of the corpus luteum or that of the remainder of the ovary. Although we have learned a great deal about the physiology of the ovary and about the relationships of its hormones, it is only fair to say that the results of the treatment of various conditions by ovarian or corpus luteum extracts are rarely striking. This, however, should not destroy our faith in the future of endocrine therapy, as it concerns ovarian extracts. There are various reasons for the poor results often obtained by ovarian organotherapy. In the first place, the biochemist has not as yet given us the active principle or principles of the ovaries. Then, again, the pharmacist cannot assure us that the present-day methods of preparing ovarian extracts do not destroy these active principles. Finally, we cannot be sure that the active agents are not destroyed by the gastrointestinal juices when the extracts are administered by mouth. A good example of the interrelationship of the ovary with other endocrine glands is the type of case Dr. Judd mentioned. In this case, which was characterized by amenorrhea and obesity, we are obviously dealing with a hypopituitary syndrome. The condition is now well recognized under the designation of adiposogenital dystrophy. In these cases, there is a hypoplasia of the pelvic organs, which is evidently the result of a hypogenitalism. The latter, however, is clearly secondary to the pituitary disorder, as has been demonstrated by both experimental and clinical observation. In such cases ovarian and pituitary substances are ordinarily administered in various combinations, and apparently on very rational grounds. The results, as a rule, however, are not very impressive, unless to these substances is added the inevitable "pinch" of thyroid, which is the one organ extract concerning which we know a great deal, and concerning whose therapeutic efficiency there can be no doubt.

USE OF THE SIGMOID FLEXURE AND CECUM IN PELVIC PERITONIZATION

CAREY CULBERTSON, M.D.
CHICAGO

Since the early days of abdominal surgery, one of the important problems confronting the operator has been that of covering or otherwise disposing of the raw areas remaining as a result of extensive peritoneal adhesions. Adhesions are either primary, due to inflammation or malignancy, or they are secondary, following operation. Roughly speaking, two varieties are commonly encountered: First, those which are cobweb or veil-like in their formation or which extend across the pelvis or abdomen in bands. These are light and readily broken up, leaving relatively little rawness, or they are dense and tough and when broken up leave numerous raw points. They are not highly vascular, so that their separation is not attended by much oozing. Second, those which represent suppurative processes. They are short and dense, more or less extensive throughout the entire affected area, are infiltrated, organized and highly vascular. They constitute the development which brings the affected organs in close apposition and produces fixation of the structures involved, and their separation opens up extensive raw areas.

It is with adhesions of this variety involving the pelvis and lower abdomen that this paper has to do. The problem consists not only in providing for the care of the raw areas left after breaking up adhesions in the pelvis or after the extirpation of the pelvic organs, but also in preventing the formation of fresh adhesions. It may be set down as an axiom that there

is no set method of avoiding postoperative adhesions in every case, even when operative technic is all that can be desired. Various methods have been employed by virtually all operators to prevent adhesions from forming after operation on both clean and infected fields. The use of ether, of sterilized oil, of silver foil and other such means need only be mentioned as having been tried and proved in the long run unsatisfactory. Transplantation of peritoneal or omental grafts is perhaps the best method for a small area of raw surface that must necessarily remain exposed. While effective as a general proposition, this method, however, has the objection of being painstaking and tedious. The ideal in operation on the pelvis when raw areas are produced is to leave none but smooth peritoneal surfaces throughout. Work on the pelvis and abdomen had not progressed very far before operators conceived this ideal situation, though it was some years before methods were perfected, and even today it is safe to say that few, if any, surgeons have attained this ideal.

The study of the literature reveals that before 1890 various clinicians had observed the frequency of spontaneous peritonization as a result of chronic pelvic peritonitis. This was noted by Quénu,[1] Amann[2] and Snegireff[3] in 1899, although Bardenhauer and Bliesener[4] had noted it as far back as 1891 and 1896. Amann put into practical application the idea of covering raw areas by the approximation of peritonized organs, using in 1900 the sigmoid flexure and the bladder and transplanting peritoneum by undermining and sliding wide layers from the anterior abdominal wall and from the bladder. Duret in 1899 and Judet[5] in 1902 finally established as a principle the using of a peritonized organ to cover the raw surface of other organs or pelvic walls, though Sneguireff in 1899 really

1. Quénu: Bull. et mém. Soc. de chir. de Paris **29**: 778, 1903.
2. Amann, J. A.: Congrès. internat. de Paris, 1900, Comp. rend., Sect. de gynéc., p. 435.
3. Snegireff: Rev. de Chir., 1899, p. 249.
4. Bliesener: Monatsschr. f. Geburtsh. u. Gynäk. **4**: 28, 1896.
5. Judet, H.: Thèse de Paris, 1902.

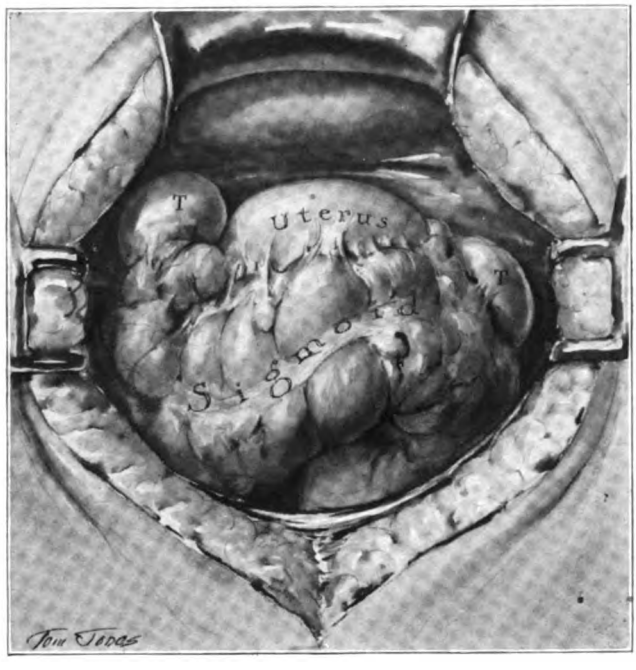

Fig. 1.—"Autoperitonization": The sigmoid flexure has become adherent to the diseased uterus and appendages and, with the rectum, has closed over the posterior culdesac.

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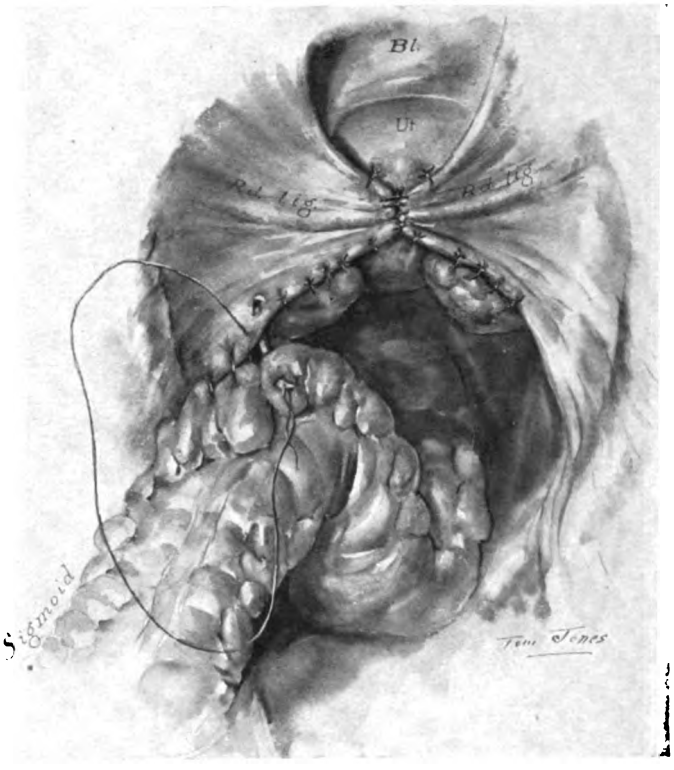

Fig. 2.—The uterus has been partially extirpated with the fallopian tubes. The ovaries have been suspended to their respective ligaments. Closure of the raw pouch of Douglas is being effected by stitching the appendices epiploicae of the sigmoid flexure along the free edges of the approximated ligaments. (Reproduced by courtesy of the W. B. Saunders Company.)

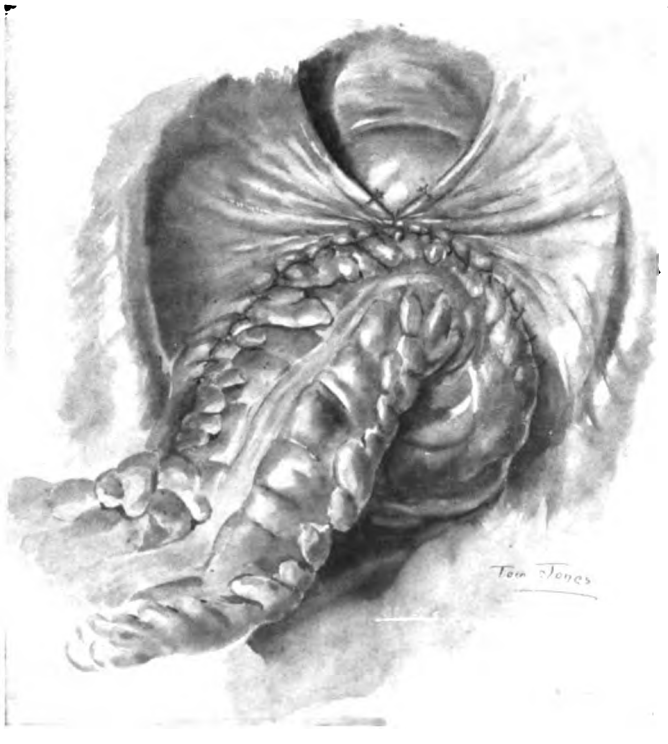

Fig. 3.—Closure of the pouch of Douglas is completed, the suture being carried around to the right until the rectum and posterior pelvic peritoneum have been approximated. (Reproduced by courtesy of the W. B. Saunders Company.)

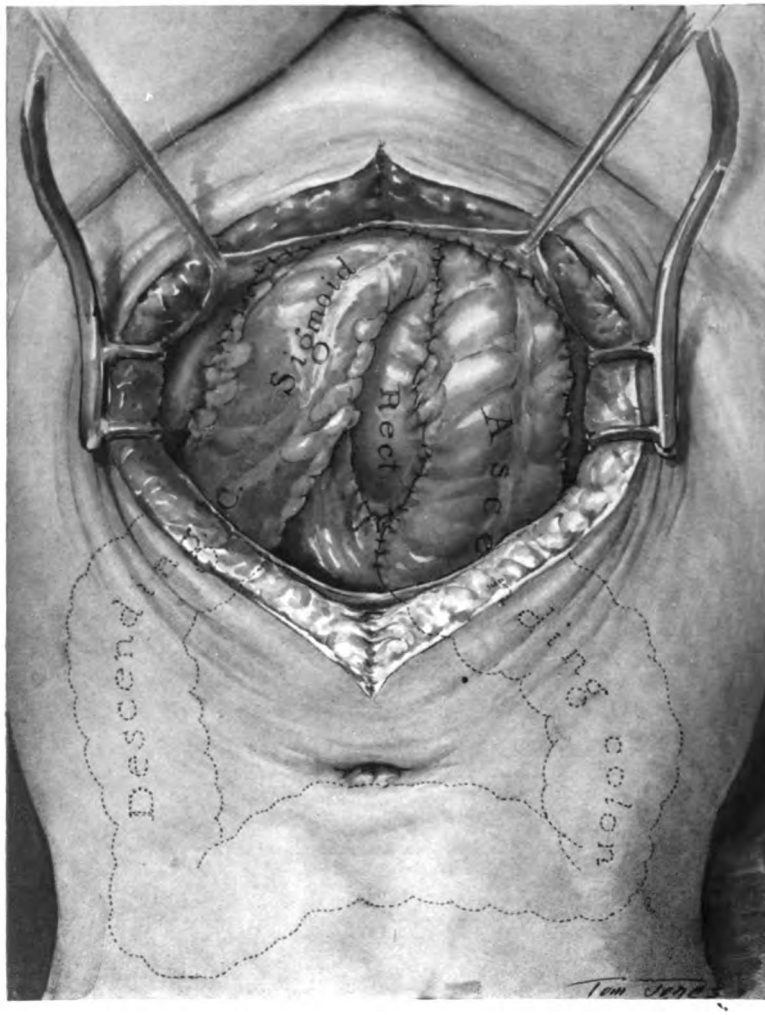

Fig. 4.—The uterus and diseased appendages have been removed. The anterior and posterior culdesacs were raw after the freeing of the adhesions and have been entirely closed over. The sigmoid flexure has been approximated with the right pelvic and lower anterior abdominal wall; the cecum, after removal of the appendix, has been approximated with the left pelvic and lower abdominal wall, the line of suture being carried down and posteriorly between the cecum and rectum and posterior pelvic peritoneal surface. Thus the entirely pelvis is blocked off from the abdominal cavity. (Reproduced by courtesy of the W. B. Saunders Company.)

devised what Buettner [6] has since called "high peritonization." From 1900 on, progress in this method of peritonization gained rapidly on the European continent, though it was not taken up so readily by surgeons in the British Empire or America. As far back as 1898, Kelly [7] used the uterus to fill a defect in the torn rectum, and Dudley [8] later described the shortening of the posterior culdesac by stitching the anterior surface of the sigmoid flexure to the posterior wall of the uterus. In all these early procedures, however, drainage was consistently employed through the abdominal wall or through the vagina, and usually by both routes at the same time. Rouffart-Hénault [9] peritonized the pelvis after abdominal hysterectomy by drawing the peritoneum of the upper pelvis together by a sort of purse-string suture, the lower pelvis having been tamponed with gauze leading out through the vagina, while drainage above this plane of peritonization led out through the abdominal wall. This required extensive mobilization of peritoneum on all sides of the pelvic walls except the posterior, and took in such structures as the rectum, sigmoid flexure, the cecum or the bladder as might prove to be necessary in order to approximate peritoneal edges. In the modern application of this idea not only is drainage not necessary, but we know, on the contrary, that it makes for postoperative adhesions. Yet as recently as 1916, Chaput [10] maintained drainage in his *cloisonnement* procedures, which partitions the pelvis in four ways: first, *cloisonnement transversal;* second, *cloisonnement susvaginal;* third, *cloisonnement vertical postérieur;* fourth, *cloisonnement vertical antérieur.* According to Buettner, Frank performed the first so-called high

6. Buettner, O.: Bull. Soc. d'obst. et de gynéc. de la Suisse Rom. (Gynelog. Helvet. **16**: 13).
7. Kelly, H.: Operative Gynecology **2**: 20, 1898.
8. Dudley, A. P.: Am. J. Obst. **24**: 952.
9. Rouffart-Hénault, L.: Thèse de Bruxelles, 1910.
10. Chaput, H.: Ann. de gynéc. et d'obst., November-December, 1916; Bull. Soc. anat. de Paris, October-November, 1894, No. 23.

peritonization in 1881 after a case of cesarean section by the Porro method, and later applied the same principle to operations for pelvic inflammation.

In 1898, Kelly described four positions which may be regarded as the normal attitude of the sigmoid flexure, and he later suggested that if laid over the raw pelvis in one of these positions it might become spontaneously adherent, thus blocking off the lower raw pelvis from organs high up and preventing adhesions. In 1911 Summers [11] described an operation whereby the pelvis is peritonized after hysterectomy, by the sigmoid flexure, a procedure which he had used for twelve or fourteen years previously with or without drainage, and which is based on the ideas already set forth. Webster [12] removed the diseased swelling and entire uterus with the exception of its anterior peritoneal layer, which was left continuous with the broad ligaments. This flap extending across the pelvis was turned backward and stitched to the rectum and posterior pelvic wall. Soon after describing this method, however, he abandoned it for the simpler sigmoid-rectal peritonization which has remained his routine procedure.

In my opinion it is freedom of the ileum in postoperative involvement that is most desired, since it is involvement of the ileum that is the cause of the most distress on the part of the patient. It is true that intestinal obstruction may take place as a result of sigmoid flexure involvement, though this is more commonly the case where malignancy exists than in inflammation. When the ileum is already involved in the inflammatory process it must, of course, be freed, and peritonization of its raw surfaces is best effected by omental or peritoneal transplants, since the ileum must be capable of perfect freedom. The same, however, is not true of the sigmoid flexure, which appears to function quite as well when there is at least relative

11. Summers, J. E.: Surg., Gynec. & Obst. **13**: 125, 1911.
12. Webster, J. C.: Diseases of Women, 1907, p. 234.

immobilization; hence the surest way to keep the ileum out of the pelvis is to block off entirely the true pelvis. This blocking off is best brought about by the use of the lower portions of the large intestine, the sigmoid colon and rectum being used alone, or with the cecum on the right side after the appendix has been removed. The infiltrated and raw areas so often present on the sigmoid, rectum and cecum are rolled under by the same procedure. In 518 cases of pelvic peritonitis in which careful notation was made of the findings at operation, the sigmoid was involved in greater or less extent 274 times; its walls were infiltrated 124 times, and in three cases showed necrotic areas. The rectum was involved 387 times; its walls were infiltrated 199 times and perforated three times. The cecum was adherent sixty-seven times, and its walls were infiltrated twenty-one times. The bladder was adherent, usually to the uterus, in 149 cases, with infiltrated wall in twenty-four cases; but in ten cases the adhesions were to the sigmoid flexure and in three to the cecum.

Instead of trusting to the sigmoid flexure to become adherent, as Kelly suggested, its adhesion is brought about directly, and the place where it is to become adherent is definitely determined. The technic is best described if we suppose a case of generalized peritonitis due to a bilateral salpingitis in which the tubes and the uterus have been removed, the ovaries remaining in situ. If the sigmoid flexure has been adherent over the uterus and appendages, it is freed except for its attachment to the left pelvic wall. After the removal of the affected organs and the ligation of all bleeding points, the sigmoid is allowed to fall back over the true pelvis so that all raw areas are covered. The round ligaments have been stitched previously into the cervical stump or over the vaginal vault as the case may be, a procedure which in itself brings the clean peritoneal surfaces of the upper pelvis lower

down and closer together. Beginning at that point where the peritoneal coat of the sigmoid is reflected from that of the pelvic wall, a light continuous catgut suture is started and is carried along just above the line of the raw tissue on the pelvic wall and just above the corresponding line on the sigmoid flexure as far as the left round ligament. Here the reflected flap of peritoneum belonging to the bladder is picked up and united with the sigmoid flexure across the center of the pelvis until the right round ligament is reached. From this point on the right pelvic wall and the sigmoid colon are brought into peritoneal approximation as was done on the left side until the shelf of the pelvis is reached, by which time the suture passes from the sigmoid to the rectum and is continued, uniting the rectum with the posterior peritoneum as far as the point where the rectal peritoneum is reflected, approximately just to the right of the promontory of the sacrum. It is extremely important that these posterior peritoneal surfaces be approximated, otherwise a hole would be left through which a coil of the ileum might prolapse into the lower pelvis. In following this method it is seldom necessary to put very many stitches into the intestinal wall itself since the appendics epiploicae are usually abundant, and these fat tabs are ideally placed for this method of peritonization. Only when they are absent as a result of extensive inflammatory involvement of the colon itself does it become necessary to stitch directly into the intestinal wall. Further, in order to come out on the right side of the rectum at a point where this suture ends, it will be neecssary to rotate the sigmoid flexure one-half or less on its axis. This rotation is best accomplished in midpelvis where the vesical peritoneum is brought into use, since here flexibility of peritoneal structures is greatest, and hence there will be less tension.

In the great majority of cases the sigmoid flexure is large enough to accomplish this purpose. Only rarely

and exceptionally is it so short that it cannot be used in this manner. In 518 abdominal operations for pelvic peritonitis, I found the sigmoid flexure absent but once. Only rarely is it not sufficiently long to cover unusually extensive raw areas, such as are formed when the anterior culdesac is involved together with the posterior in the inflammatory process. Here the cecum may be used to close over the right side of the pelvis while the sigmoid covers its left and center. While typically employed after hysterectomy, this type of peritonization is quite as effective in covering raw areas when the uterus remains in toto or when it has been decreased in size by fundal amputation. In a series of 543 cases that have been carefully tabulated from May, 1913, to May, 1921, sigmoid—rectal peritonization has been done 359 times. In addition to this, the rectum has been used for partial peritonization sixteen times. The method has been used after total hysterectomy thirty-two times; after subtotal hysterectomy, 122 times; after fundal amputation of the uterus, 180 times; with round ligament shortening, three times; and without hysterectomy, five times. The sigmoid was brought up over the bladder twenty-four times, and the cecum was brought in to cover the right pelvic wall twenty-eight times.

In connection with this, omental graft to cover infiltrated areas on the ileum was employed twenty-eight times. In the great majority of these operations, indication lay in pelvic peritonitis; but in twenty-five cases, sigmoid flexure peritonization was found useful after operation for uterine fibroma, uterine carcinoma, tubal gestation and ovarian cystoma.

30 North Michigan Avenue.

ABSTRACT OF DISCUSSION

DR. CARL B. DAVIS, Chicago: Every one who opens the abdomen should be thoroughly familiar with this technic. The procedure is more valuable in women than in men. It is

occasionally useful in end-to-end anastomasis of the large intestine. But its chief value is following infections of the female genitalia. Adhesions of the uterus to the anterior or posterior culdesac leave raw spaces, and many patients require secondary operation for postoperative obstruction. The mortality is terrific. A procedure of this sort will obviate many of those cases. Dr. Culbertson spoke of the ease with which the sigmoid can be moved in most cases. I have seen cases in which the sigmoid was so firmly attached that it was with great difficulty that it could be mobilized enough to obtain this result. Many times the mesosigmoid is so short that it is difficult to put it up even for a colostomy. In these cases mobilization of the ascending and descending sigmoid is helpful. I recall the case of a woman whose tubes had been removed. The sigmoid was brought back over the right broad ligament and the culdesac was closed. Several years later the patient returned with a tumor of the ovary the size of a grapefruit. The sigmoid had gradually dropped down over the fundus and covered the inflammatory area, but still retained enough motility not to cause pain. If the sigmoid will move and we can cover over the raw surface, if these things will act as a temporary check while scarring is taking place, and adhesions of the ileum are prevented, it is very much superior to the stitching of the omentum. Following in these cases there is often distress each time the stomach is filled. As the stomach fills and starts to pull there is the tug coming from those adhesions.

DR. CAREY CULBERTSON, Chicago: I want only to emphasize the fact that drainage is not necessary. In these cases abdominal drainage was employed but three times. In forty-eight cases vaginal drainage preceded the abdominal operation. One of these was twenty years prior, one six months prior, and the rest only a few weeks or days prior. In but forty-six cases, therefore, was it deemed necessary to drain pelvically in preparing the patient for the abdominal operation. As regards the question of mobilizing the sigmoid, I never free the sigmoid from the left pelvic wall, except sufficiently to get at the diseased tube, leaving the sigmoid adherent to the left pelvic wall. In but one case of this entire series was the sigmoid flexure absent. As regards the function of the sigmoid after this procedure, I have been asked many times by men who have seen me do this operation whether there was postoperative distress or constipation. I have not found this to follow, nor do I see why such results should follow. As regards the omental adhesions, the omentum, of course, is very frequently adherent when the abdomen is opened. Unless the adhesions are extremely light I never tear the omentum free. If fixed densely, I always resect it, peritonizing the raw edge of the omentum and leaving its densely adherent portion wherever it may be attached, since we want no better peritonization than that gives.

END-RESULTS OF PRENATAL CARE

ALFRED C. BECK, M.D.
BROOKLYN

This study of the results of prenatal care is based on 1,000 consecutive deliveries. All of these patients were supervised during pregnancy by the ante partum clinic and were subsequently confined either in their homes or in the hospital by the obstetric service of the Long Island College Hospital. Before discussing the results, I shall briefly describe the plan of organization and the prenatal routine of that institution (Table 1).

TABLE 1.—PLAN OF ORGANIZATION OF THE LONG ISLAND COLLEGE HOSPITAL MATERNITY SERVICE

	Prenatal Clinic	Maternity Ward
Intern	Physical examinations Abdominal palpation	Delivery of normal cases Ward routine
Resident	Pelvic measurements Abdominal palpation	Abnormal deliveries Supervision of ward
Chief of Clinic	Histories Verifies measurements of contracted pelves Final instructions to all patients	Major operations Supervision of all patients

PLAN OF ORGANIZATION

Since good judgment in obstetrics is as essential in the prenatal clinic as it is in the delivery room, the attending obstetrician of the hospital is also chief in the ante partum dispensary. His assistants are the resident and intern obstetricians. The same men, therefore, do all of the hospital and prenatal work, and as a result, our ante partum clinic is as intimately connected with the hospital maternity department, as is the delivery room. This unification of departments not only avoids friction, but gives the patient the benefit

of the attending obstetrician's opinion long before she falls into labor.

The medical personnel is assisted by three graduate nurses, two of whom are members of the Visiting Nurses' Association. These nurses devote all of their time to our work, alternating daily between service in the clinic and follow-up work in the patients' homes.

PRENATAL ROUTINE

History.—At the time of the patient's application for care in the prenatal clinic, a careful history is taken. The presence or absence of tuberculosis, insanity or hemophilia in her family is ascertained. We then inquire as to the possibility of her having had rickets, scarlet fever, diphtheria, rheumatism, syphilis, gonorrhea, cardiac disease, nephritis or a gynecologic operation. Her previous pregnancies are investigated from the standpoint of toxemia, hemorrhage and infection. Each labor is considered separately, and abnormal ones are noted. Under miscarriages are recorded the date, the duration of the pregnancy and the cause. An effort is made to ascertain the size of the previous children at birth and their health, subsequent to delivery. If any children have died, their age and the cause of death are noted. From the date of the last menstruation and quickening, the expected date of confinement is estimated.

Physical Examination.—Following the taking of the history a thorough physical examination is made. This includes an examination of the heart, lungs, breasts, abdomen, vagina and extremities, urinalysis, blood pressure determination and pelvimetry. Blood for the Wassermann reaction is taken from each patient.

Instructions to Patients.—If nothing abnormal is anticipated and the patient is a multipara, she is informed that she will be cared for during confinement in her home. All primiparas and patients with anticipated abnormalities come to the hospital for delivery.

Before leaving the clinic, each patient receives a pamphlet containing instructions as to the hygiene of pregnancy. In simple language, the following items are discussed: the care of the mouth and teeth, diet, bathing, rest, exercise, clothing, sexual intercourse, the care of the bowels and the schedule of return visits with directions for collecting and measuring the specimen of urine which is to be examined. In addition, the things needed for a delivery in the home are noted, and a list of necessities for the baby is given.

Home Visits by the Prenatal Nurse.—Within a few days, the patient's home is visited by the nurse who was present during her examination. If our instructions were not clearly understood, the nurse carefully explains whatever is necessary, and in addition renders such social service as is possible.

Return Visits.—During the first five months, return visits are made monthly. These are increased to biweekly during the sixth and seventh months, and weekly during the last two months. About 80 per cent. who do not come back are seen by the visiting nurses, who make monthly calls on each patient.

At each of these return visits, the symptoms of toxemia and hemorrhage are considered. The blood pressure is taken and the urine examined. One month before the estimated date of confinement, an abdominal examination is made to determine the presentation, size and condition of the fetus.

Several times before delivery the patients return to what are called the "show clinics." These are held twice weekly and consist of demonstrations by the nurses.

Figures 1 and 2 are a reproduction of a specimen record from the prenatal clinic.

SPECIAL ROUTINE DURING THE FIRST TRIMESTER

During the first trimester, an effort is made to anticipate and prevent abortion and excessive nausea and vomiting.

THE LONG ISLAND COLLEGE HOSPITAL

DEPARTMENT OF OBSTETRICS

No.

PRENATAL RECORD

Name JOHNSON, MARY Date MAR. 3, 1921.

Address 151 BUTLER STREET Near COURT ST. Floor 2 Room REAR

Age 24 Nation U.S. Color B. W. Para 2 Occupation H W

Previous Admissions NONE

By whom referred FORMER PATIENT Date of marriage JUNE 1918

Family History NO INSANITY ? TUBERCULOSIS OR HEMOPHILIA

Personal History: Rickets, Scarlet-Fever, Diphtheria, Rheumatism, Syphilis, Gonorrhoea, Pelvic Trouble, Heart, Lungs, Kidneys, Operations

Previous Obstetric History: Vomiting, Headaches, Oedema, Hemorrhage, Eclampsia, Infection

Labors { normal / abnormal } FIRST PREGNANCY TERMINATED SPONTANEOUSLY AT THE SEVENTH MONTH. STILL BIRTH MACERATED FETUS.

Miscarriages NONE

Children—Weight at birth SMALL Age of oldest ---- Age of youngest ----- No. Dead 1

Cause of death STILL BORN, MACERATED, SEVENTH MONTH

Menstrual History—Type 28 day Duration 5 DAYS Pain NONE First 14 Yr.

LAST MENSTRUATION Sept. 12, 1920 Quickening 4½ MONTHS

Estimated Date of Confinement JUNE 19, 1921.

EXAMINATION By Whom DR. BECK

Heart Normal in size, no murmur, sounds clear.

Lungs NEG.

Breasts LARGE Nipples GOOD Colostrum PRESENT

Abdomen FD OF FLUID Striae MANY

Foetal Movements PRESENT Contractions PRESENT

Date	Pres. Posit.	Foetal Heart	Size of Foetus	Height of Fundus	Engagement
MAR 5, 21	????	L.L.Q 140	6½ MO.	17 cm.	NONE
MAY-19 '21	L.O.A.	L.L.Q.	36 wks.	24cm.	NONE.

Measurements

Interspinal 23 cm. Intercristal 25 cm. Intertrochanteric 29 cm.

External Conj. 16½ cm. Diagonal Conj. 9 cm. Bisischial 8½ cm.

Diagnosis of Pelvis GENERALLY CONTRACTED

Fig. 1.—Reproduction of specimen record from prenatal clinic of the Long Island College Hospital.

Nausea and Vomiting of Pregnancy.—Nausea and vomiting of pregnancy are minimized by giving special care to the diet and elimination. Patients are urged to drink at least 8 glasses of water daily. The bowels are regulated by the employment of mild laxatives.

Vaginal Examination

Perineum ~~Intact~~ Lacerated ~~Cystocele~~ ~~Rectocele~~

Cervix Condition ~~Intact~~ ~~Lacerated~~ Position ~~Ant~~ Post

Consistency ~~Soft~~ Firm Portio ~~Effaced~~ Intact Ballottement PRESENT

Secretion

PATIENT HAS NO PRIVATE PHYSICIAN

Occupation of Husband LABORER Wages $ 18 Total income $ 18

Rent $ 15 per month 2 Rooms No. in family 2

Promises to Pay $ 000

Date 1921	3/3	3/7	3/14	21	28	4/4	4/11	4/18	4/25	5/2	11	19	26
Wasserman	4 +	4 +											
Vomiting	0		0		0	0	0	0	0	0	0	0	0
Headaches	0		0		0	0	0	0	0	0	+	0	0
Oedema	0	WASSERMAN +	0		0	0	0	0	0	0	0	0	0
Visual Disturb	0		0		0	0	0	0	0	0	0	0	0
Bowels	OK		OK		OK	OK	OK	OK	OK	OK	OK	OK	OK
Hemorrhage	0		0		0	0	0	0	0	0	0	0	0
Pulse	90	ELEVATED	86		84	86	88	84	86	86	88	84	86
Blood Pressure	100		95		108	95	100	108	110	95	110	120	115
Urine S. G.	1018		16										
Reaction	Acid												
Albumen	0												
Sugar	0												
Acetone	0												
Casts	0												
Blood	0												
Medication	-		ARSPHENAMIN MERCURY		ARSPHENAMIN MERCURY	ARSPHENAMIN MERCURY	ARSPHENAMIN MERCURY	ARSPHENAMIN MERCURY		MERCURY	MERCURY	MERCURY	MERCURY
Name of Doctor	B												

Visited by Nurse Miss R. Date 3/9 Statement of social condition {Verified / ~~Not Verified~~}

Report of Nurse PROMISES TO RETURN FOR ARSPHENAMIN

Fig. 2.—Reproduction of reverse side of record.

Hyperacidity is combated by the use of antacids, and a diet rich in carbohydrates is given. These simple measures, when used prophylactically, have greatly diminished the nausea and vomiting in our cases. During the last nine years, it has been necessary to refer only one patient to the hospital from the prenatal clinic because of hyperemesis. In her case, the presence of a multiple pregnancy was a causative factor, and she subsequently gave birth to triplets.

Abortion.—With the exception of the correction of misplacements, very little is accomplished in the prophylaxis against the underlying or predisposing causes of abortion. All patients are warned of the common exciting causes of this condition. They are urged to avoid exertion, strap-hanging in street cars and sea bathing, and are told to remain in bed whenever a blood stained vaginal discharge is observed. Because of our inability to eliminate the predisposing causes and the patient's difficulty in avoiding the exciting causes, our results have been very discouraging.

SPECIAL ROUTINE DURING THE SECOND TRIMESTER

In our experience, syphilis, toxema and cardiac disease have been responsible for most of the interruptions of pregnancy during the second trimester. I shall, therefore, outline our routine in each of these conditions.

Syphilis.—We are unable to obtain a history of the common symptoms of syphilis in most of our patients who are afflicted with this disease, therefore, blood for the Wassermann test is taken from each applicant to our clinic at the time of her first visit. If the Wassermann reaction is positive, it is repeated in order that the possibility of laboratory error may be eliminated. Whenever the repeated Wassermann reaction is positive, intensive treatment is instituted. This consists of weekly intravenous injections of arsphenamin and intramuscular injections of mercury for six weeks, followed by six weekly injections of mercury. If after these six arsphenamin and twelve mercury injections, the Wassermann reaction is still positive, a second similar course of the same drugs is given. We not only have no fear of causing a miscarriage or premature labor by this procedure, but we believe that we have prevented the latter in many cases by prompt and active treatment. Thirty cases of syphilis are included in the series herein analyzed. One of these terminated

in a stillbirth, one infant died within twenty-four hours after birth, and one died of pneumonia in its seventh week. The remaining twenty-seven are living and doing well, only six of them having shown any evidence of syphilis.

Toxemia.—In the diagnosis of toxemia, we depend on the urine findings, the blood pressure and the usual symptoms—headache, vomiting, edema and visual disturbances. Whenever this condition is suspected, our patients return daily for observation until we are able to tell from which type they are suffering. In the slowly progressing type, we are able to keep them relatively free from symptoms by the use of a low protein or milk diet and increased elimination. During the last weeks of pregnancy, these patients are admitted to the maternity ward where daily blood pressure and albumin determinations are made, in addition to weekly blood chemistry observations. We seldom have any anxiety concerning the immediate maternal result in this group. Occasionally, however, the infants are stillborn. At times we have felt that a warning of the approaching death of the fetus was given by a sudden increase in the blood pressure and albuminuria. In the hope of saving the infant, it, therefore, is our practice to induce labor in these cases in the last few weeks, whenever this sudden increase is observed.

In the rapidly progressing type, the patients are sent to the hospital at once. Eliminative measures are continued, but in the great majority of cases no improvement is noted. If, in spite of treatment, the blood pressure and albuminuria increase and the symptoms progress in severity, the pregnancy is terminated.

Thirty-seven cases of toxemia are included in this study. None of these reached the stage of eclampsia, and all of the mothers recovered. Four infants were stillborn.

Cardiac Disease.—The department of internal medicine cooperates with us in the care of all patients with cardiac disorders. Under their supervision, cardiac tonics are prescribed. Warning against exertion is repeatedly given, and rest in bed one week out of every four is urged. Should dyspnea occur the patient is brought to the hospital. In those cases that are well compensated, it is our custom to allow the pregnancy to go to term irrespective of the lesion. Delivery usually is spontaneous under morphin and scopolamin. In the event of a break in compensation, medical treatment is employed until sufficient improvement is obtained to permit of the termination of the pregnancy. In these cases, we prefer to perform a cesarean section under gas anesthesia whenever possible, in order that sterilization may also be accomplished.

SPECIAL ROUTINE DURING THE LAST TRIMESTER

During the last trimester, in addition to increased watchfulness for early symptoms of toxemia, our efforts are directed toward the prophylactic care of the breasts, the relief of pressure symptoms, the prevention of premature labor and the recognition of abnormal presentation and its causes.

Routine Care of Breasts.—Eight weeks before the expected date of confinement, prophylactic care of the breasts is begun. This consists of the application of liquid petrolatum to the nipples after a careful preliminary cleansing with soap and water. As most of our patients live in the tenements where ordinary cleanliness is absent, the details of this technic are carefully demonstrated by the nurses.

Pressure Symptoms.—Our nurses aid materially in the relief of the distressing pressure symptoms by furnishing, whenever possible, proper abdominal supporters and correcting faulty habits of dress.

Premature Labor.—In addition to receiving the printed instructions concerning the hygiene of preg-

nancy, the patients are repeatedly advised by the visiting nurses of the possibility of premature labor whenever their habits are faulty. This is work that must be done in the homes, and good results can be accomplished only by those nurses who can gain the confidence of the patients. We ascribe the great diminution in premature deliveries largely to the conscientious efforts of our prenatal nurses.

Abnormal Presentation.—Four weeks before term, the presentation, size and condition of the fetus are determined by abdominal examination. Breech and transverse presentations are corrected, whenever possible, by external version. If the abnormal presentations recur, we insist on hospital care during confinement. Patients with marked obliquity of the uterus are instructed to lie on the side which is opposite the obliquity from the onset of labor. If a patient has a pendulous abdomen or an excessive amount of amniotic fluid, the possibility of an abnormal presentation or prolapse of the cord is considered, and she is told to remain in bed throughout labor.

TABLE 2.—ANALYSIS OF ONE THOUSAND CONSECUTIVE CASES *

CONTRACTED PELVIS

	Number
Generally contracted	36
Flat	27
Funnel	43
Total	106
Diagonal conjugate 10.5 cm. or under	20
Bisischial 7.5 cm. or under	14

* These were the contracted pelves which were observed in the series of 1,000 cases, not a series of 1,000 contracted pelves. The same is meant in the headings of the following tables.

ANALYSIS OF CASES

One hundred and six of the patients included in this series had contracted pelves. While most of these were slight, in twenty the diagonal conjugate was 10.5 cm., or less, and the bisischial was 7.5 cm., or under,

in fourteen. Table 2 shows the frequency of the several types encountered.

Complications of pregnancy sufficiently grave to influence the end-results were observed in seventy-seven cases. Of these, toxemia, syphilis and cardiac disease were the most common. In Table 3 these conditions with their frequency are enumerated.

TABLE 3.—ANALYSIS OF ONE THOUSAND CONSECUTIVE CASES

CONDITIONS COMPLICATING PREGNANCY AND LABOR

	Number
Mitral stenosis	4
Mitral regurgitation	3
Syphilis	30
Toxemia	37
Placenta praevia	2
Premature separation of the placenta	2
Twins	4
Large fibroids of the uterus	3

Table 4 gives the various abnormal presentations. In spite of our efforts to prevent their occurrence, abnormal presentations were observed in forty cases, an incidence of 4 per cent. While this high frequency does not look well from the standpoint of prevention, our prenatal work was sufficiently accurate to enable us to anticipate most of them, and as a result led to hospital care in all but four of the forty deliveries.

TABLE 4.—ANALYSIS OF ONE THOUSAND CONSECUTIVE CASES

ABNORMAL PRESENTATION

	Number
Breech	27
Face and brow	6
Transverse	4
Prolapsed cord	2
Complex	1
Total	40

Operative interference was required in only sixty cases. The types of operation and their frequency are shown in Table 5. In addition to the procedures enumerated, median perineotomy was frequently performed

in primiparas, especially if the fetal heart showed signs of asphyxia. All of these operations were performed in the hospital under the best possible conditions. The low incidence in the use of forceps is striking and shows how rare the maternal and fetal indications for this procedure really are, when median perineotomy is added to the obstetrician's armamentarium.

TABLE 5.—ANALYSIS OF ONE THOUSAND CONSECUTIVE CASES

OPERATIONS

	Number
Forceps	22
Version	5
Introduction of bag	4
Conversion of face to vertex	2
Perforation of after-coming head	1
Cesarean section	8
	Per Cent.
Incidence of forceps	2.2
Incidence of version	0.5
Incidence of cesarean section	0.8

The maternal morbidity and mortality are shown in Table 6. Seven patients had suppurative mastitis, and in fifty-nine the puerperium was febrile, an incidence of 5.9 per cent. Following the last epidemic of influenza, our maternity ward was visited by an epidemic

TABLE 6.—MATERNAL MORBIDITY AND MORTALITY *

	Number
Morbidity:	
Mastitis	7
Febrile puerperium	59
Pneumonia	1
Mortality:	
Pneumonia	1
Puerperal infection	3
Total	4 or 0.4%

* In 4,500 consecutive cases, similar to, and including, this 1,000, seven maternal deaths occurred, an incidence of 1 to 643 cases (0.15 per cent.).

of puerperal infection. Many of the cases of febrile puerperium occurred at that time. Patients who enter the hospital subsequent to prenatal supervision seldom have a temperature over 99 F. This absence of morbidity is due no doubt to the fact that our antepartum

work eliminates the necessity of vaginal examinations. Unless operative interference is required, the progress of labor in these is followed solely by abdominal and rectal examination.

Our maternal mortality, unfortunately, was higher than usual in this series. One fatality was due to influenzal pneumonia and three occurred during the epidemic of puerperal infection. In 4,500 consecutive cases, similar to, and including, the thousand which are analyzed in this paper, only three mothers died, in addition to the four above recorded, an incidence of one death in 643 cases.

TABLE 7.—ANALYSIS OF ONE THOUSAND CONSECUTIVE CASES

INFANT MORTALITY

		Number	Per Cent.
Stillbirths		19	1.9
Breech—large head	3		
Placenta praevia	1		
Accidental hemorrhage	2		
Toxemia	4		
Syphilis	1		
Full term—macerated	3		
Full term—not macerated	1		
Second twin macerated, first living	2		
Version—cord complication	1		
Full term—cord around neck	1		
Deaths of infants under 14 days		6	0.6
Acrania, died three hours	1		
Premature, died four days	1		
Full term, died one day (syphilis)	1		
Full term, died four days	2		
Umbilical hemorrhage	1		
Total		25	2.5

Prenatal supervision leads to the anticipation of those abnormalities which are best cared for in the hospitals. These conditions are treated early in labor at a time when the operative procedures accompanied by least risk are applicable; and as a result, maternal morbidity and mortality are reduced to the minimum.

As a result of the progressive increase in the efficiency of our prenatal organization and routine, the infant mortality grows less each year. Table 7 gives the stillbirths and the infant deaths which occurred in

TABLE 8.—COMPARISON OF THREE SERIES OF CASES

	Cause of Death										
	Congenital Defect	Prematurity	Trauma	Syphilis	Toxemia	Miscellaneous	Unknown	Hospital	Physician	Midwife	Total
Series I *											
Stillbirths	..	..	3	1	4	5	6	19	..	..	19
Infant deaths	1	1	..	1	..	1	2	6	..	..	6
Total	1	1	3	2	4	6	8	25	..	..	25
Series II †											
Stillbirths	..	3	12	1	2	..	7	8	15	2	25
Infant deaths	5	5	1	1	2	..	8	11	8	3	22
Total	5	8	13	2	4	..	15	19	23	5	47
Series III ‡											
Stillbirths	..	6	12	..	8	..	14	4	26	5	35
Infant deaths	8	15	8	..	..	..	10	9	28	4	41
Total	8	21	20	..	8	..	24	13	54	9	76

* Series I. Infant mortality in 1,000 cases under prenatal supervision of the Long Island College Hospital.

† Series II. Infant mortality in 1,000 cases under nursing supervision of the Visiting Nurses' Association, with no systematic medical supervision.

‡ Series III. Infant mortality in 1,000 cases in which there was no prenatal care.

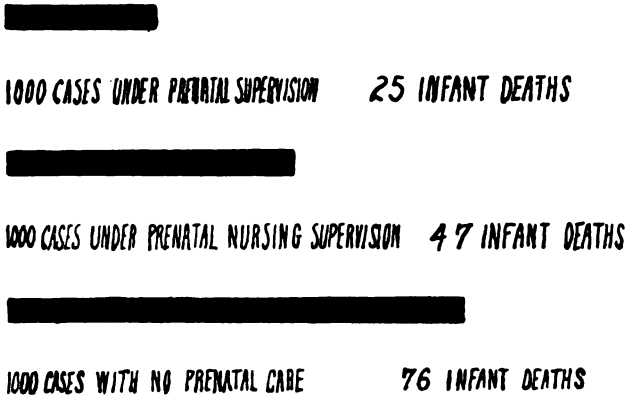
1000 CASES UNDER PRENATAL SUPERVISION
25 INFANT DEATHS
1000 CASES UNDER PRENATAL NURSING SUPERVISION
47 INFANT DEATHS
1000 CASES WITH NO PRENATAL CARE
76 INFANT DEATHS

Fig. 3.—Infant mortality in three series of cases.

this series. Nineteen, or 1.9 per cent., of the pregnancies terminated in stillbirths and six infants died under fourteen days; a mortality of twenty-five, or

2.5 per cent. That this low rate is due largely to prenatal care is shown by a comparison of the three series of cases recorded in Table 8.

The first is the series reported in detail in this paper (Table 7). The second was furnished to me by the Visiting Nurses' Association and consists of patients that were under the prenatal supervision of their nurses for periods of from one to seven months. Systematic medical supervision was lacking in this group.

The third series consists of 1,000 patients that received less than one month of prenatal supervision by their nurses, or none at all. Systematic medical attention likewise was not given. The infant mortality in these three series was 25 per thousand, 47 per thousand, and 76 per thousand, respectively. A graphic representation of this comparison is shown in Figure 3.

I wish to acknowledge my appreciation of the aid rendered our service by the Red Cross and the Brooklyn Visiting Nurses' Association and to express my thanks to Dr. J. O. Polak and my associates for their valuable suggestions and assistance.

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ABSTRACT OF DISCUSSION

DR. JOSEPH B. DE LEE, Chicago: We have tried to take care of women from the very earliest months of pregnancy, with a view of preventing abortion. I agree with Dr. Beck that it is almost impossible to prevent abortions. The habitual aborter is the bane of the obstetrician. At first I was very sorry that we could not prevent all abortions. When the embryologist showed that the majority of these aborted ova were abnormal, either microscopically or macroscopically, we did not regret this conservative act of nature. We try to make routine Wassermann tests. Let me warn you from deducing from a positive Wassermann reaction that a woman is syphilitic. Tell her the Wassermann reaction is positive but that that does not mean she has syphilis, since during pregnancy the reaction is equivocal. I do not underestimate the value of the Wassermann test. Within five years we shall have to revaluate this test. Regarding a standard of morbidity: The doctor said he had fifty-nine cases of morbidity in 1.000 cases; 5.9 per cent. of puerperal women had fever. What we should have is a committee

appointed similar to that of the British Medical Society to establish a standard of morbidity. At the Chicago Lying-In Hospital, our standard of morbidity is a temperature of 99 F. My own standard is 98.6. Any woman with a temperature above 98.6 is morbid. The British standard is 100.6. It is going to be very difficult to establish a standard of morbidity. Another point I wish to bring out is the low fetal mortality of these cases: 2.5 per cent. mortality in children that were born after the seventh month. That is a wonderful result, probably unequaled. It certainly is not equaled by that practitioner who turns the babies around and draws them out by the feet when nature started them by the head. His mortality was nearly 8 per cent. Now, if a gross mortality of 2.5 per cent. can be accomplished by means of intelligent antenatal care and by means of conservative—we might say old-fashioned—methods of obstetric practice, we see no reason for introducing new methods carrying 8 per cent. mortality.

Dr. Edward A. Schumann, Philadelphia: One of the great problems underlying antenatal hygiene, in our great centers of population, is that of the young woman illegitimately pregnant, with a low standard of mentality, and afflicted with venereal disease. In Philadelphia we have just established a prenatal clinic at the Philadelphia General Hospital, which I think is destined to begin at least to solve this problem. The clinic is conducted much as any other prenatal clinic, but there is in constant attendance on clinic days a psychiatrist and a technician from the laboratory of the hospital. Any case presenting the slightest evidence of mental abnormality is studied coincidently and concurrently by the psychiatrist and the obstetrician; the necessary laboratory work is done. We get a report quickly. The institutional care in mental deficiency cases can be carried on coincidently with ordinary prenatal care. We hope great things for this clinic, although not much has been accomplished yet.

Dr. Hugo Ehrenfest, St. Louis: The majority of physicians are more interested to know how far these very interesting rules for proper prenatal care as carried out by public clinics can be applied to private practice. Of course, there are distinct differences in the prenatal care of the private patients; however, the general principles as laid down by Dr. Beck should be followed. Under present housing conditions people are forced more and more to seek hospital accommodations for confinement. With the limitation of such accommodations in all larger cities, obstetric patients are forced to apply to their physician rather early in pregnancy. Probably 75 per cent. of my patients appear in the office about the third or fourth month of pregnancy. This is a factor which has some very important bearing on present day successful prenatal care also in private work. Outside of this rather beneficial effect on proper prenatal care, I have observed another influence of the housing problem, and

that is on the development of hyperemesis. Young married couples are crowded into the so-called efficiency apartment, one or two rooms with a kitchenette off the supposed-to-be dining room. These women at the beginning of a pregnancy are forced to do their own cooking and smell the kitchenette odor while they are eating. I think that this represents an interesting and important factor in exaggerated vomiting now observed by me in more cases than ever before. It is a difficult problem to handle. I have made it a routine as soon as these patients begin to vomit to put them in a hospital under the care of the dietitian. Occasionlly I used a little bromid. In the main, all we have to do is to serve these patients very small meals at short intervals. It is remarkable how quickly they will get over the nausea and begin to eat. We test them out on bigger meals and let them go home. This, to my mind, is a very interesting observation in view of the unsettled state of the nausea question. In private practice the Wassermann test as a routine is neither desirable nor necessary.

Dr. Alfred C. Beck, Brooklyn: Concerning the Wassermann reaction, our experience has been similar to that of Dr. De Lee. Recently I drew attention to the fact that in all probability we were being misled even in normal pregnancy cases by the Wassermann test. It is hard to say what we should do with the patients who have two positive Wassermann reactions and no other evidence of syphilis. Is it desirable to take the risk of having a child born with syphilis because we dislike to use intensive treatment in such cases? Dr. Schumann's suggestion is a very good one, and I hope that we may be able to get the cooperation of the department of psychiatry in our cases. With regard to nausea and vomiting: In all my work with clinic cases, I have noticed that the tendency toward this condition is very much less than with the private patients. So that while we have not had these cases in the clinic, I certainly have had them in my private practice. But when these measures are used prophylactically, it does not cut down the incidence of the really troublesome cases.

OBSERVATIONS ON HEMORRHAGES OF OVARIAN AND TUBAL ORIGIN

NOT ASSOCIATED WITH ECTOPIC PREGNANCY

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Hemorrhage into the abdominal cavity from an ovary or fallopian tube is so generally due to the terminal changes in an ectopic ovum that the recognition of other causes for the bleeding has been rather neglected, even though such other causes are known to exist.

There has been developed recently, however, a fairly voluminous literature on the subject, as is indicated by the list of fifty-four titles included in the masterly review of Richard Smith.[1]

Pelvic hemorrhages originating in the reproductive tract independently of extra-uterine pregnancy may have their source in the ovary, or the tube, may result from uterine neoplasms, or rarely from tumors of the round ligament. The last two groups are purely mechanical and traumatic in their nature and are not to be considered at this time.

DIAGNOSIS OF HEMORRHAGES OF OVARIAN OR TUBAL ORIGIN

Those hemorrhages from the tube or ovary of obscure pathology and unknown etiology are still unsolved problems in gynecology and require further study for their elucidation. The points at issue in this connection are the facts concerned with the diagnosis and the details of the pathogenesis of these accidents.

1. Smith, Richard: Hemorrhages into the Pelvic Cavity Other Than Those of Ectopic Pregnancy, Tr. Am. Gynec. Soc. 45: 321, 1920.

The preoperative differentiation from hemorrhage due to ectopic pregnancy is rarely possible save in those cases in which the virginity of the patient is beyond all question.

The symptomatology and the clinical picture are simply characteristic of sudden intraperitoneal hemorrhage, more or less in amount, and usually associated with acute pain in one or the other iliac fossae, although in a few cases the initial pain is entirely absent, distress only becoming apparent when the irritating effect of the free blood in the peritoneal cavity produces its usually dull, generalized abdominal ache. There follows usually some distention, with signs of shock and severe blood loss, or the sthenic reaction of elevation of temperature, moderate leukocytosis, rectus rigidity, and in general, the syndrome of the "acute abdomen."

The important point in the preoperative diagnosis is that from the personal, as well as the medicolegal, standpoint, a diagnosis of ectopic pregnancy should not be made in cases in which pregnancy should not exist. I feel strongly in accord with Bovée on this point.

Bovée [2] believes that in the presence of hemorrhage of tubal or ovarian origin, when there is not positive clinical evidence of pregnancy as evinced by the finding of a fetus or chorionic villi, one is not justified in making a diagnosis of extra-uterine pregnancy, unless proved by microscopic examination, and supports his contention by a record of twenty-nine cases of supposed ectopic gestation with free hemorrhage from the ovary and tube, in which microscopic evidence supported the diagnosis in but seventeen. This rather extreme view is counterbalanced by the work of Caturani [3] who examined, from the pathologic standpoint, 100 specimens of suspected extra-uterine pregnancy, finding positive evidences of this lesion in eighty-five, only fifteen proving to be negative.

2. Bovée, J. W.: The Conflict of Clinical and Microscopical Evidence in the Diagnosis of Tubal and Ovarian Pregnancies, Am. J. Obst. 77: 370 (March) 1918.

3. Caturani, M.: To What Extent Must We Depend upon the Microscopical Examination to Support the Clinical Diagnosis of Ectopic Pregnancy? Am. J. Obst. 79: 716 (June) 1919.

Fig. 1.—Left ovary (gross specimen): *R*, site of rupture.

Fig. 2.—Low power view of area near the site of hemorrhage: *Bl*, blood clot; *V*, vessels with thickened degenerated walls.

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Fig. 3.—High power view of area near the hemorrhage, showing clearly the degenerated and thickened vessel walls.

The one group of cases of this sort wherein a preoperative diagnosis may be hazarded is that fairly common one in which growing girls, during one of their early menstrual periods, display all the phenomena of intraperitoneal hemorrhage. Three such cases have come under my observation recently, the diagnosis being unconfirmed in all, since no operative interference was practiced and all recovered.

One of these may be cited as typical:

Miss M., a healthy and normally developed girl, had menstruated fairly regularly three times. At the expected date of the fourth menstrual period, she was suddenly seized with a violent pain in the right iliac fossa, with rapidly developing, though moderate, shock and fainting. She rallied from the attack within a few hours, but complained of generalized increasing abdominal pain and tenderness, with distention. The temperature rose to 101 F. and there was marked right rectus rigidity. I saw the patient twenty-four hours after the initial symptoms, with Dr. William G. Shields, Jr., her physician. At first glance the picture was that of an acute appendicitis; but an analysis of the anamnesis made it apparent that hemorrhage into the abdomen was the etiologic factor, and that as the symptoms were distinctly those of a lower abdominal lesion, the ovary was probably at fault. Rectal examination disclosed a tender, doughy mass in the culdesac, and the right ovary was exquisitely sensitive. In view of the age of the patient and the fact that the hemorrhage had apparently ceased, the case was treated expectantly, with uneventful recovery, the clot in the culdesac having been absorbed and being absent to rectal touch some months later.

It is my belief that similar cases are not uncommon and that they rarely result fatally even without surgical interference. The oft quoted case of Scanzoni,[4] reported in 1845, in which an 18 year old girl died as a result of a menstrual ovarian hemorrhage, is not sufficiently accurately described to affect this view, since Scanzoni states that the ovary contained a sac the size of a hen's egg, through a rent in which 6 pounds of blood had escaped into the abdomen. This case, in the light of our present knowledge, is strongly suggestive of ovarian pregnancy.

4. Scanzoni, F. W.: Lehrbuch der weiblichen sexual Organe, Vienna, 1863, p. 402.

It is probable that such ovarian hemorrhages are more or less functional errors, that is, an excess of bleeding from the wall of the mature grafian follicle in the adolescent ovary, and that there is no demonstrable morphologic change present in the tissues.

The type of case that gives rise to the greatest confusion is that in which more or less severe hemorrhage takes place from the ovary of mature women and in which the occurrence of extra-uterine pregnancy is a possibility. Here the preoperative diagnosis is extremely difficult although the history is sometimes suggestive, in that there has been nothing unusual noted with regard to the menstrual cycle and especially in that there is no associated uterine bleeding.

It is my experience that in the great majority of cases of extra-uterine pregnancy the death of the ovum is signalized by the occurrence of some degree of bleeding from the uterus, even though the amount of blood discharged is extremely small. On examination, the usual softening of the cervix is also absent, though this phenomenon is not an essential accompaniment of ectopic gestation, and its absence is not noteworthy. In addition, there are practically never any evidences of the concomitant signs of early pregnancy. These vague and negative features are practically the only aids to differential diagnosis and, needless to say, it is the rare exception that a correct conclusion is reached as to the etiology of the intraperitoneal bleeding.

The loss of blood naturally varies, thus, as pointed out by Novak [5] in his analysis, there was a small amount of hemorrhage in the case reported by Jayle and others while the patients of Burge and Cohn each lost 2 liters of blood and in Peuch's fatal case 3 pints were lost.

The treatment, of course, is immediate laparotomy with oophorectomy or resection of the hemorrhagic portion of the ovary.

5. Novak, E.: Hemorrhage of Ovarian Origin, Bull. Johns Hopkins Hosp. 38: 736, 1918.

TYPES OF HEMORRHAGE OF OVARIAN ORIGIN

The pathology and the etiology of these lesions are probably their most interesting and puzzling characteristics. In a careful study of the subject, Wolf [6] divides hemorrhages of ovarian origin into three types: (1) interstitial; (2) follicular, and, (3) intrafollicular.

According to Pfannannenstiel, these three varieties are of no practical difference, one type running into the other, and, indeed, all three may be present in the same ovary. Savage [7] divides the sites of the hemorrhage into hematoma of the graafian follicle and hematoma of the corpus luteum. In the first type, he found that in places the wall of the hematoma was lined by a single layer of epithelium which he regarded as the membrana granulosa, lying on a basement membrane, and external to these two layers of tissue which appeared to correspond to the theca interna and the theca externa, both being vascularized, especially the former. The cells of the inner layer showed early lutein formation. Savage also found ill developed graafian follicles near the cavity of the hematoma, and some opening into it. In the second type, hematoma of the corpus luteum, he found that there was an outer shell of ovarian tissue which was for the most part congested. The inner part of the wall showed newly formed fibrous tissue, poor in cells. Near the lining in between the longitudinal strands of the tissue there were blood extravasations, many round cells and many large rounded cubodial cells containing coarse, yellow granules. The nuclei of these cells were relatively small and in many instances seemed to be crowded toward the periphery of the cell.

In contradistinction to Savage, Novak believes that the original site of graafian follicle hemorrhage is in the perifollicular stroma, and that it only later breaks into the follicle.

6. Wolf, E. H.: Ueber Hematoma Ovarii, Arch. f. Gynäk. **84**: 211, 1908.

7. Savage: Brit. M. J. **21**: 285; quoted by Hedley, J. P.: Hematoma of the Ovary, J. Obst. & Gynec. Brit. Emp. **18**: 293, 1910.

All observers are agreed that true stromal hemorrhage is very rare.

The search for an etiologic factor or factors in this connection is most baffling. Whether sclerocystic degeneration or a true fibrosis is at the bottom of the bleeding remains a matter of conjecture. Bovée [8] makes the statement that no other organ in the body is so frequently the seat of hemorrhage as is the ovary, and it follows that there must be a varied and sometimes vague morphologic basis on which to account for the bleeding.

Some light may be thrown on this matter by the study of a case recently coming under my observation:

M. P. (7464 a), white, aged 37, married, was admitted to the Frankford Hospital, Sept. 9, 1920, suffering from generalized abdominal pain of one week's duration, with marked weakness.

The previous history was irrelevant. she had had seven normal labors and no miscarriages. Menstruation had always been regular, until thirteen years before, since when she has had irregular bleeding. Two months before admission she missed a menstrual period, after which a fairly profuse flow took place. For three weeks prior to admission, she had more or less constant uterine bleeding. For the last week, there has been considerable abdominal pain with increasing weakness.

The patient was a well nourished woman without lesions of the chest. Vaginally there was a soft, doughy mass in the culdesac and marked tenderness about the right ovary.

The temperature was 100 F., the pulse rate 90. The blood examination was: hemoglobin 45 per cent., red blood cells, 1,800,000; white blood cells, 6,600. The urine was negative as was the Wassermann reaction.

With these finding, a diagnosis of ruptured ectopic pregnancy was made and immediate laparotomy performed.

Upon incising the peritoneum, there was disclosed a massive hemorrhage of several days' duration, and on inspection, the right ovary was found to be the source of the bleeding, a ruptured hemorrhagic cystic cavity being apparent on its inferior aspect. The tube and the left ovary were normal. The ovary was removed, the patient making an uneventful convalescence.

Microscopically the ovary measured 4 by 4 by 3 cm. The surface presented the usual corrugated appearance of the mature ovary, and on the lower posterior surface was the cavity of a ruptured cystic area, measuring in its collapsed state

8. Bovée, J. W.: Tubal and Ovarian Hemorrhages, Surg., Gynec & Obst. 28: 117 (Feb.) 1919.

4 cm. in diameter. There were several minute hemorrhagic areas scattered throughout the parenchyma of the ovary, and there was no gross evidence of perioophoritis. (Fig. 1).

Microscopically, a section transversely through the body of the organ passing about at the place where the hemorrhage occurred, reveals a distorted organ very rich in blood vessels and poor in ovarian stroma. Numerous hyalin scars are seen and several yellow bodies. One recent follicle is lined with lutein cells. All these bodies, save one, seem normal. The one recent follicle is surrounded by a fresh hemorrhage. Aside from ovarian stroma, the interstitial tissue is relatively loose, except about the blood vessels; and in one place it is decidedly hemorrhagic (Fig. 2). The blood vessels are exceedingly numerous and present very wide walls. They vary in size from arterioles to ½ a Zeiss A lens field. Nearly every vessel shows some subintimal and mesial degeneration (Fig. 3). The degree of this change is not greatly in excess of what might be expected in a late adult ovary; but the excessive number of vessels with their marked degeneration is noteworthy. It is possible that a rupture of one of them is responsible for the interstitial hemorrhage; but examination of several sections fails to reveal a rupture connected with a follicle. One area of marked accumulation of cells of the corpus luteum type are arranged in a form to suggest decidual formation; but there are no true villi present (opinion of Herbert Fox[9]).

Summarized, the pathologic condition existing in the case cited above is that of marked proliferation of the normal perifollicular vessels with an excessive degenerative arteritis of these vessels, and it is to this point in particular that attention is directed. While a certain degree of arterial degeneration is physiologic in the vascular network embracing the mature follicle, it is my opinion that such physiologic degenerative change is never responsible for massive hemorrhage, and when such accident does occur, some pathologic process must be present, as, in this case, a degenerative arteritis.

That such change can occur without other evidence of ovarian disease is well known, although the direct cause of the arteritis remains obscure.

Tubal hemorrhage in the absence of ectopic gestation is rare, and though instances are recorded in the litera-

9. Fox, Herbert, Director, Pepper Laboratory, University of Pennsylvania, personal communications.

ture, few of them withstand close scrutiny. There may be slight bleeding into the tube as remarked by Smith, especially in the presence of acute gonorrheal salpingitis, but even this is uncommon. Bovée quotes two cases, one of Ellsworth's, in which a young girl developed the signs of acute appendicitis on the day before menstruation was due and on operation there was found a notable intraperitoneal hemorrhage with a small laceration of the ampulla and of the tube and without microscopic evidence of pregnancy.

The other case is quoted by Leonard Freeman and is that of an athletic young girl, who, in vaulting over a fence, experienced violent pain in the abdomen and went into collapse. The abdomen was opened and the fallopian tube found torn near its middle. The uterus and other appendages appeared otherwise normal with no evidence of pregnancy. Both these cases are rather vague and do not throw additional light on the subject of tubal hemorrhage.

One case of this sort came under my observation:

An unmarried woman, aged 30, had noted a sharp attack of left sided pelvic pain, one year before admission. The pain gradually subsided, to recur at the menstrual period with increasing severity, each month. There was pain on defecation and slight loss of weight. On examination, a distinct mass was palpated in the left vaginal vault. Operation revealed a greatly distended left tube, the enlargement measuring 5 cm. in diameter, being globular in character and occupying the middle third of the tube. There was a small, organized pelvic hematocele, and the right tube and both ovaries were normal. The left tube was excised, the patient making an uneventful recovery.

On section of the tube the mass was found to consist of old organized blood clot. Microscopically, there was considerable erosion of the mucosa by hemorrhage into the muscular coat, but no evidence whatever of decidual formation, villi or syncitial cells.

CONCLUSIONS

The conclusions to be reached from the foregoing observations are:

First, that a diagnosis of extra-uterine pregnancy should never be definitely made until an embryo is found or evidences of decidual and placental formation

are revealed by the microscope. This is particularly true in cases in which the social state of the patient precludes legitimate pregnancy.

Second, that when massive hemorrhage takes place from an ovary, there is usually, if not always, to be found some disease of the ovarian blood vessels. Normal ovaries do not give rise to massive hemorrhage.

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ABSTRACT OF DISCUSSION

DR. EMIL NOVAK, Baltimore: When a surgeon opens the abdomen of a woman and finds it to be full of blood his first thought is of a ruptured extra-uterine pregnancy, and in the overwhelming majority of cases this assumption will prove to be correct. On the other hand, as Dr. Schumann has pointed out, there is a relatively small but well defined group of cases in which no evidence of pregnancy will be found. The most interesting group of cases is that in which the hemorrhage is the result of the rupture of a small follicular or corpus luteum cyst of the ovary, more commonly the latter. Some years ago I reviewed the literature of this subject. I compiled thirty-five cases of extensive abdominal hemorrhage of ovarian origin. Hematomas of the ovary are very common and are almost always caused by hemorrhage into the lumen of an atretic follicle or corpus luteum. Surrounding the wall of each follicular cyst of the ovary is a perifollicular vascular wreath which is the immediate source of the bleeding. In certain cases, however, the hemorrhage is of the perforative type, the blood breaking through the surface of the ovary and causing abdominal hemorrhage of varying degrees. Not a few fatal cases have been reported, and in one case of my own the patient was almost completely exsanguinated. The importance of this form of abdominal hemorrhage is obvious, and its possibility should always be borne in mind. A rather more glaring type of ovarian hemorrhage is not infrequently seen as a rupture of thin-walled ovarian cysts by bimanual examination before operation. All teachers of gynecology who are at times called on to operate after a number of students have examined the patient under anesthesia, have observed this occurrence.

DR. ALBERT GOLDSPOHN, Chicago: I have had little difficulty in distinguishing tubal pregnancy from a beginning ordinary spontaneous abortion, because by bimanual palpation the uterus is usually found to be larger and to have a different shape and consistence in the latter than in the former condition. The features which have been most serviceable to me in the diagnosis of tubal pregnancy have been: (1) some irregularity with the last one or two menstrual periods, in

being delayed or intermittently prolonged, usually with more or less pain of an unusual character in the affected side; (2) persistence of turgescence and tenderness of the breasts in those women in whom this is a usual feature during menstruation, and (3) local tenderness associated, in most cases, with some soft swelling which is found by gentle and careful bimanual examination, in the affected side. The essayist has well said that the literature records quite a number of well authenticated cases of intraperitoneal pelvic bleeding from a corpus luteum or from a cystic graafian follicle. A notable case was reported by Schauta of Vienna, who did a hysterectomy and left a large ovary with a corpus luteum unmolested. During the next day the patient became sick from internal hemorrhage, which was found to have come from that corpus luteum by reoperation. These hemorrhages emphasize the pathologic nature of large and persistent corpora lutea that are not associated with pregnancy and of the cysts arising from them; likewise of the graafian follicle retention cysts, in which the ovule is usually dead and which cause much more pain than do cystadenomas (true neoplasms) of much larger size. The indication is therefore plain that, when an opportunity is afforded during a pelvic section for other reasons, ovaries should also be relieved of these degenerate formations by resection. In severely sick patients who are emergency cases, without an intelligent history, I have sometimes had difficulty in determining whether it was blood or pus that the pelvis contained. I have then made a transverse vaginal cautery incision into Douglas' pouch. Gauze drainage there for a few days adds much to the postoperative comfort of the patient in the ectopic section case; and it can be made to improve greatly and sometimes to cure the acutely septic case without a subsequent laparotomy, when the virulence of the infection has died out.

DR. EDWARD A. SCHUMANN, Philadelphia: I regret that my experience based on a study of 400 cases has not corresponded with Dr. Goldspohn's. I find so usual a disturbance of the breasts, minor in degree, associated with the ordinary menstrual period of young women, that a differentiation of that almost physiologic disturbance from the disturbance of the very early weeks of pregnancy is difficult. In Philadelphia, at least, patients usually come to the surgeon within the first five weeks, when the breast changes have not been particularly noteworthy. With regard to the differential diagnosis between blood and pus in the culdesac, we feel that in the majority of cases the diagnosis should be made easily without the necessity for vaginal puncture. I am very loath to do a colpotomy when I suspect blood in the abdomen, feeling that the convalescence can be much better obtained by an abdominal section alone without the added risk of possible introduction of infection by the vaginal route. I have seen few cases in which vaginal puncture is indicated.

TRANSPERITONEAL CESAREAN SECTION

HIGH OPERATION—COPELAND TECHNIC

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On examining many modern textbooks on obstetrics for the technic of transperitoneal cesarean section, I have been impressed by the lack of many essential details, notable variations of opinions, and much vagueness. Observations on the operating technic of various surgeons and the apparent lack of a clear mutual understanding among the individuals composing their operating teams, and numerous discussions with many physicians and nurses concerning the actual performance of this operation convinced me that there was still much room for improvement. Having studied this operation for about ten years, and having developed a technic which is safer, swifter and surer than any other of which I know, one which has safely stood the test of subsequent labors, I have felt that you might be interested in hearing of it.

The late Professor Cragin said in his "Practice of Obstetrics," "The question is often asked, What is the advantage of a quick operation in the performance of a cesarean section? Why is a fourteen and two-third minutes completed operation" (Cragin's fastest) "better than one consuming an hour? All surgeons realize that any operation in which careful technic is sacrificed to time, is faulty in the extreme. However, in a cesarean section, a careful technic coupled with a short time, is preferable to a careful technic

coupled with a long time, for these reasons: From the first cut in the uterus, until the uterine incision is closed and the uterus replaced in the abdominal cavity, the woman is losing blood from the uterine sinuses. The loss of blood means lessened resistance to infection, and a slower convalescence. Hence, if performed with the same care, a short cesarean section is better for the woman than a long one." I would add to this, that the faster the operation, the easier it is to obtain good apposition between the cut edges of the uterus. There is a primary and very uniform contraction of the uterus as soon as it is emptied. This is the optimum time to suture the several layers of the uterine muscle with an inclusive bite of the needle through all the layers when using a running suture. (Original) Irregular contractions appear rather quickly following uneven massage, and loss of tone, and good apposition and hemostasis become increasingly difficult. A rapid operation markedly lessens shock, hemorrhage, exhaustion, chilling, handling of abdominal contents, and poisoning from the anesthetic. Hence, any *safe* technic which shortens the time of operation, and is so simple of execution that any one with fair surgical training can readily employ it, is worthy of careful consideration. For, while the margin of safety is wide in the average case, a surgeon with a slow and complicated technic can never speed up without danger of losing something essential in an urgent case, such as a central placenta praevia with severe hemorrhage, when a swift operation might well be life-saving.

Preoperative precautions should include a careful selection of cases, elimination of all vaginal examinations and manipulations when cesarean section may later become necessary. Trial by labor in border-line cases should be short, unless reasonable progress, as determined by abdominorectal examination, is being made. Exhaustion of the mother and child should be forestalled. Operation should be performed early. In

definitely contaminated cases extraperitoneal cesarean section or some procedure other than the classic operation should be employed, Brouha [1] to the contrary, notwithstanding. The patient should be encouraged. Watson has ably described "The Indications and Limitations of Caesarean Section," [2] and has shown how dangerous this operation is, even today, unless properly performed. In cases that are not of an emergency nature the patients should have a high carbohydrate diet for a few days if possible, and a guaranteed sleep the night previous to the operation. No purgation is given except for complicating toxemia.

Having critically examined various types of cesarean section, I reached some important conclusions, only two of which I shall discuss here.

First, if several methods of suturing the uterus and abdominal wall give equal end-results, but if one method is outstandingly simple and swift, obviously it is the one to adopt. The continuous or running suture is safe as proved by the work of Cragin, De Lee and others, and is much simplier and faster than numerous interrupted sutures. Nonessentials, such as eventrating the uterus, or packing it off before opening, dilating the cervix, clamping the broad ligaments and silk sutures, I eliminated.

Second, the psychology of teamwork in this operation has not been adequately applied among the profession at large. To those of you with a well organized and permanent operating staff, the following remarks may seem trite, but I work with a rapidly changing personnel, as most of us do. I gradually realized how important it was to overcome the nervousness of a willing, but inexperienced, nurse assisting at, perhaps, her first cesarean section. I now, therefore, just before the operation, explain carefully and fully to the instru-

1. Brouha: Cesarean Section in Infected Cases, Gynec. et Obstet. **2**: 385, 1920; abstr., J. A. M. A. **76**: 1283 (April 30) 1921.
2. Watson, B. P.: The Indications and Limitations of Cesarean Section, Canad. M. Monthly **4**: 89 (April) 1920.

ment nurse, in a friendly way, exactly what I wish her to prepare, and the order in which I shall ask for needles, sutures, etc. Should a nurse fail to read the mind of the surgeon, and hand the wrong instrument, and if he starts to shout at her, she becomes confused, the surgeon fails to get the best possible service, the operation is delayed, and the patient suffers. I believe firmly that the human element in the operating team has been very much neglected—it is the weak link. I strengthen this link and expedite the operation at least a quarter of an hour.

COPELAND TECHNIC

I carefully explain to each of my various assistants before each operation, the exact procedures I will probably perform, and how and when I will expect them to carry out the particular parts I shall assign to each of them. The time I spend in instructing and coaching the operating team before the operation starts is time that many surgeons lose at the expense of the patient during the actual performance of the operation, because they have failed to grasp the great importance of this point. This is an absolutely essential part of my technic.

The following instructions, necessarily brief in this paper, are varied to suit each individual operation. I explain the whole operation, and then assign special duties to each assistant.

Instrument Nurse.—All needles are to be large and curved. Needles for the uterus and peritoneum must not have cutting edges, but for the fascia and skin cutting edged needles are used. All sutures, except the silkworm gut tension sutures for the skin, are to be long, double and knotted. First, for suturing the uterus, thread three large muscle needles with medium tanned, chromic catgut, No. 1. Hand the needles to me without any needle holder, as I ask for them, as soon as the baby is removed. Second, for the peritoneum, thread one large muscle needle with plain catgut, No. 0. Verify sponge count. Third, for the fascia, thread two large cutting edged needles with chromic catgut, No. 2. Fourth, for the skin, thread four large cutting edged needles with silkworm gut

and hand to me on needle holders. Have ready Richter's magazine holder loaded with Michel clips to close the skin; instruments, apparatus and drapings as for ordinary laparotomy; special, McDonald's solution for abdomen and hands of operating team, no iodin; Crossen's continuous gauze sponge. I confirm all this before starting.

Anesthetist.—I prefer nitrous-oxid with the maximum of oxygen and a little ether, or what is more convenient, and very satisfactory is the specially purified Dupont ether invented by my friend, Dr. James Cotton of Toronto. *I want the minimum of anesthetic, consistent with complete loss of pain and absence of straining.* When I am ready to start the skin incision, flood the mother with several breaths of pure oxygen to hyperoxygenate the baby, as I have described elsewhere.[3] This is valuable, as it guarantees the baby's being in the best possible condition on extraction from the uterus and usually immediate crying. As soon as the baby is removed, give by hypodermic, ¼ grain morphin sulphate, and 1/150 grain atropin sulphate.

Resuscitator of Baby.—To be aseptic; no mask; to stand at foot of table to my right. Wrap sterile towel around the legs of the baby, and grasp it firmly to prevent slipping. The steps I usually employ to start the baby breathing are: inversion, clearing the throat, spanking and hot bath. These failing, perform direct mouth to mouth insufflation through sterile gauze first filling your own lungs with pure oxygen (original), pressing on stomach to prevent the entry of air except to lungs. Cragin's[4] throw is valuable. A personal explanation of the value of this method of resuscitation is that the sudden throw upward notably increases the blood pressure; the return should be rather slow, since, if too rapid, it lowers the blood pressure (Personal experiments).

First Assistant.—The best available surgeon: Please sponge, help me open peritoneum, and when I remove the baby, clamp cord with two forceps and cut between. As I remove the afterbirth, inject into several places in the fundus uteri, parts of 1 c.c. of pituitary extract from an all sterile syringe till all is given. If I ask you to remove the afterbirth, avoid the cervix, which is probably not sterile and which always opens promptly as soon as the uterus is emptied. Redrape, sponge cut edges of the uterus, tie sutures, follow me up, pulling suture snugly but not tightly, push edges of uterus together to minimize tearing effect on the muscle. Cut loose ends. Lift abdominal walls when uterus is closed so I can replace it. Pick up peritoneum on my side with Kocher's forceps, I will do the same on yours. Hold peritoneum together while I sew it up. Similarly, assist me with the fascia. While I am closing the upper half of the fascia, you insert the silkworm gut tension suture at the bottom of the cut, being careful to

3. Copeland, G. G.: Nitrous Oxid-Oxygen Analgesia and Anesthesia in Obstetrics, Canad. M. J. 1: 405 (May) 1917.
4. Cragin: Practice of Obstetrics, Figs. 256 and 257, 1916, Lea & Fibeger.

avoid cutting sutures already in the fascia. Go through the skin and fascia, and leave the ends loose; I will tie them. Cut all loose ends at the bottom, the second assistant will cut all the upper loose ends. You hold the skin edges together and slightly everted while I place the Michel skin clips. Apply McDonald's solution and dressing.

Second Assistant.—Usually a house surgeon: Press sides of abdomen so as to push the uterus tightly against the midline. The baby removed, cover upper half of cut with a hot wet sterile towel to protect the intestines. Grasp the uterus at the cervix with both hands, thumbs under and behind, fingers at side. Bring uterus out of abdomen and hold up, handy for surgeon to suture. Cut all upper loose ends of suture about one-fourth inch from the knot. Sponge, as suturing is done. Keep bowels back. Pull Crossen sponge toward you.

Timekeeper.—Call out the time taken from the instant of the first cut, when the baby is removed, when the afterbirth is removed, when the uterus is completely sutured, when the skin is completely closed.

Surgeon.—I stand on the right side of the patient, assistants on the left, resuscitator to my right. McDonald's solution is applied to the abdomen, then sterile drapes. I pin an open bag of Crossen's continuous gauze sponge on the right side of the drapes. When the patient is ready, she is flooded with oxygen.

Operation.—Time: I make a rapid incision from above downward for about 5 inches, more or less, depending on the patient. The incision is started about an inch above and an inch to the *right* of the umbilicus to compensate for the usual dextrorotation of the uterus, and also to prevent the wound's being drawn down into a hole, which happens if the cut is too close to the umbilicus, which sinks in during convalescence. I bring the lower end of the cut to the midline. Keeping the incision away from the umbilicus lessens the chances of maceration and infection. (Original) The peritoneum is carefully opened with scissors between the fingers. The uterus, still in the abdomen, is opened in its anterior upper third in its midline, using a fresh knife. Generally, three strokes are employed in making the 5 inch opening. The last stroke is made very carefully to avoid cutting into the membranes which usually promptly bulge at this stage and are carefully nicked and opened by the fingers, or if the placenta is encountered, I shell it off the uterus upward with the fingers, till the membranes are reached. These are then opened, and a foot grasped and the child carefully extracted. Up to this stage, I proceed cautiously to avoid cutting a chance loop of bowel, cutting the baby or injuring it by forcibly jerking it out of the uterus, the three real dangers. After that I proceed as fast as I can, consistent with a good technic. Handing the child to the resuscitator, after the first assistant has cut the cord between the clamps, I remove the afterbirth,

keeping away from the cervix as much as possible, unless a placenta praevia forces me to go to that locality. After rinsing my hands, I take a Copeland tissue forceps in the left hand and the large muscle needle in the right hand threaded with chromic catgut, double and long. The assistants have meanwhile put in the pituitary extract and applied fresh drapes, and are holding the uterus up accessible and sponged. Starting at the bottom of the uterine cut, I *take deep bites through the whole of the uterine muscle down to the mucosa.* The value of this is shown by De Lee. I use only my fingers as needle holders, thereby saving at least a hundred needless steps which would be necessary if I used a needle driver. I use a running suture, taking from five to ten stitches, depending on the length of the uterine incision and the condition of the muscle; the firmer the muscle, the fewer the stitches. Usually one layer to the muscle is sufficient, occasionally two. The peritoneal surface of the uterus I invert with a Cushing suture, taking bites about one-fourth inch to one-half inch long, parallel to and one-fourth inch from the cut edge. When finished, no sutures show, the uterus is quite smooth, only two knots are visible. Adhesions are minimized. In the average operation, I have now taken five minutes from the time of the first skin cut.

If only a little blood remains in the abdomen, it is not sponged out, as sponging favors adhesions. Leave it. I return the uterus to the abdomen and watch for bleeding. If oozing has occurred, I have tried hot towel compression; this failing. a mattress suture. I here make sure that no foreign body is left behind; the peritoneum is secured and closed with plain No. 1 or No. 0 catgut on a large muscle needle. The fascia is closed with No. 2 chromic catgut, double, locking frequently, and using a large cutting edged needle. I then go to the bottom of the cut and tie the silkworm gut tension sutures placed by the first assistant while I was finishing the closure of the fascia. This done, I bring the skin together with Michel clips. Time. McDonald's solution and dressing.

RESULTS

I have performed cesarean sections about twenty-nine times, as well as assisting at about as many more. There have, fortunately, been no deaths due to the operation in my series.

Two women died who were operated on. Death in both these cases was prognosed before the operation as highly probable, but two babies were saved, otherwise positively doomed. The first woman to die was a primipara, at full term, not in labor, with a rigid cervix and who was having convulsions alternating with coma. The immediate operative recovery was good; but she died in thirty hours, quite sud-

denly, immediately following a hemiplegia. She never came out of the coma in which I saw her for the first time in consultation. The case is more fully described in my last article on eclampsia,[5] and forms one of the very few deaths in a large series of eclamptic patients. The second death was in a primipara, a rachitic dwarf, sent into my service after thirty hours' futile labor, the head not even being engaged. She also had influenza complicated by universal bronchopneumonia during the height of the 1918 epidemic. Immediate operative recovery was good, but the lungs filled up. Death was from the progressive pneumonia, and occurred in twenty-four hours after operation.

Twenty-three of these women had contracted pelves. The operation was performed for the second time in four cases, and for the third time in one. Sterilization has been done in addition to the cesarean in five cases. In several of these women, there were other complications, such as preeclamptic toxemia, advanced age and weak heart. One woman had central placenta praevia with massive hemorrhage. Both the mother and child were saved. There was one case of obstructed labor from congenital pelvic kidney, fuller report later; two cases of spondylolisthesis of the fifth lumbar vertebra; two women with normal pelves, but histories of previous severe labors, serious lacerations followed by extensive operations, to avoid a repetition of which they asked me to perform cesarean section.

While this is a small series compared with the experience of some surgeons, yet the improvements in my operating methods have been progressive.

Since standardizing my technic, I have performed about twelve completed cesarean sections in about fifteen minutes or under. The fastest cesarean section, combined with sterilization attained by excising wedges of the uterus containing the tubes, from the instant of the first cut till the abdomen was completely closed and a dressing applied, was fifteen minutes and forty seconds. The other operating times were: fifteen, fifteen, fourteen, twelve and one-half, eleven and three-quarters,

5. Copeland, G. G.: The Treatment of Eclampsia: Observations, Methods and Results in Some Fifty-Three Consecutive Cases, with 3.7 per cent. Mortality, Canad. M. Monthly 4: 106 (April) 1920.

ten and one-third, ten, and nine and three-quarters minutes. The last group of three were performed within twenty-four hours, Cotton process ether being used, and two being performed for the second time, which caused some delay owing to some adhesions, as I had used iodin at the first operations. The last three consecutive operations, with the aid of good assistants, I performed in nine minutes and forty seconds, eight minutes and fifty seconds, and my fastest time to date is ***eight minutes thirty-five seconds for the completed operation.*** In all of these the child took more than a minute to extract, while my fastest extraction was twenty-five seconds. Flooding the mother with oxygen prevents any need for haste. Almost as good speed has been made in the performance of the actual cesarean part of other operations, but the presence of complications has increased the total time. When a uterus bleeds abnormally, time ***must*** be spent to make sure of hemostasis. I wish to state most emphatically that in all these fast operations, safety has been of first importance, and speed has been attained not by reckless slashing, lightning-like movements, or genius, but by hard won experience and skill, to some extent. Mostly, however, it has been attained by loyal cooperation on the part of my assistants as a result of mutual preoperative understanding, by the elimination of nonessentials, which I studied to some purpose under Sir John Bland-Sutton. The ultimate good results depended in no small measure on the attainment of the aseptic technic so well taught me by Dr. Wilbur Ward of New York in Sloane Hospital, and the careful selection of cases as was impressed on me here at Harvard.

A careful preoperative preparation, a capable anesthetist, giving a minimum of anesthetic, a simple, rapid operation with the least possible handling, and good postoperative care have resulted in my patients having as a rule, a remarkably smooth recovery.

If I shall have impressed the men who performed only an occasional cesarean section, with the great value of a preoperative discussion, I shall feel justified in reading this paper.

While I know that I have not yet performed a perfect operation, yet nothing but the best surgical practice has been followed, nothing essential has been omitted, nothing unnecessary done. To have taken a longer time would not have guaranteed greater care, nor better work; but I assure you these speeds have not been reached in a day. Several of the women operated on have subsequently had severe labors under other physicians, with bad results, but the uterine suture has stood firm. I always feel that my methods are not final, but in a state of evolution, ever striving toward that impossible perfection so well described by Monte Cristo, "Human inventions march from the complex to the simple, and simplicity is always perfection."

I wish to express my thanks to my various assistants for their loyal cooperation and suggestions, particularly to Drs. T. A. Robinson, Manning, Howard Harrison, Cotton, Perfect, Wesley Willinsky, Simpson, Kinnear, Agnew and others, and to my anesthetists, particularly Drs. Carveths, Robson, Park, Tuck, Hollis, Norman, Webster and T. R. Hanley.

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ABSTRACT OF DISCUSSION

DR. WILBER WARD, New York: The particular merit of Dr. Copeland's procedures is their utter simplicity. I am not quite in accord with the present day tendency of the multiplicity of drapings of the abdominal wound—abdominal pads, retractors, etc. Dr. Copeland uses no pad, except for the purpose of retaining the intestines at the upper angle of the wound after the uterus has been delivered and is everted for purposes of suture. He does not protect the abdominal incision with sterile drapings prior to incision of the uterus. I have seen quite a few operators do cesarean sections under varying conditions, and some of them have been most elaborate in their technic. They have made slow incisions through the abdominal walls, have put on sterile towels to protect the edges of the incision, have carefully walled off the uterus with pads so as to protect the adjacent viscera, have in certain cases even put in sutures in the interior sur-

face of the uterus prior to its incision, so as to make sure the incision should be in the midline. I have seen these patients in their convalescence, and there is no question in my mind that convalescence is much more stormy, as expressed in the usual terms of nausea and vomiting, distention, pain and even fever. Dr. Copeland's method is very simple. Frankly, I do not think it makes much difference whether one uses a needle holder or not; whether one uses a large needle with No. 1 catgut or a smaller needle with No. 0 catgut, or whether the catgut is plain or chromicized. The incision in the uterine wall falls together quite naturally and very well even without sutures. Of course, one would not advocate the omission of sutures. The point is that the suture of the uterus should be clean and neat, but it does not make a great deal of difference as to what sutures are used, whether two layers or three layers for the uterine musculature. I disagree emphatically with Dr. Copeland on the question of time. I do not think it possible for any one to time operations with a watch and not miss a trick. To attempt to hurry, or to beat a previous record is poor surgery. A fifteen minute operation is better than one taking an hour, but the extra two or three minutes will not count in the long run.

Dr. W. M. Brown, Rochester, N. Y.: I agree with Dr. Ward in his criticism of the dangers of too much speed in these operations. Of course, speed in all surgical work is to be sought, but certainly not at the expense of careful surgical technic. The convalescence and the after-result in these cases depends on the careful technic with which the closure is done. The technic has evolved from the old long incision, eviscerating the abdominal cavity, packing off the intestines, and then opening the uterus, to the Davis operation, with a very short supra-umbilical incision, and later the admirable operation suggested by De Lee. A low incision, practically a cervical cesarean section, which has some of the benefits of the extraperitoneal and the transperitoneal operation at the same time, will ultimately be the operation of choice. Speed is desirable in getting the uterus emptied and the preparations made for the closure. After that time should be taken to do the work carefully and with minute attention to detail. The question of assistants is of importance. I have chosen one man who acts as may first assistant, who always is there, and who knows the work. He can do it just as well as I can. There is practically never a word uttered during the operation. The assistant motions to the nurse, who has been trained so that she knows beforehand. They know just what sutures and what needles and everything else are required. I seldom do a cesarean section in twenty minutes, but I usually have the baby in the next room in from two to two and one-half minutes. For anesthesia I am using Cotton ether. Generally I operate under a very limited amount of gas, really a state of analgesia—plus 0.5 per cent. of procain locally, and the con-

valescence of the patients is marvelously better under those conditions. As soon as I have opened the peritoneum, the uterus is held firmly against the abdominal wall by pressure, making a partial incision through the uterine muscle; and then before I have gone into the uterine cavity I take the ordinary towel clamps and just snap the uterine incision right up to the abdominal incision, which holds the uterus. The incision is finished through the uterus. The baby is lifted out, and the placenta delivered, and then the intramuscular sutures are inserted before those clamps are taken off. In that way I do not use any packing at all. The result is that I do not have to attend to any peritoneal toilet at all, and that is of great value. It saves time, and certainly does not interfere with convalescence.

DR. P. B. SALATICH, New Orleans: In a clean case, it does not make much difference what form of operation is performed. In a septic case conditions are different. On the method I have followed, and one most of us use at the Hotel Dieu, we have made, ahead of time, a large rubber sheet. In the center, about 8 by 10, we have sewed a piece of rubber tissue, and a small opening (2 by 2) is made in this rubber tissue. This is only for septic cases. We make an incision sufficiently large to deliver the uterus, and then we slip this piece of rubber tissue over the uterus, and that completely isolates and cuts off the abdominal cavity. Then we incise the uterus and remove the baby, sterilizing as well as possible the uterus before we return it into the abdomen.

DR. JOSEPH B. DE LEE, Chicago: It is time for us to unite on a set of names for the various forms of cesarean section which are now being promulgated. I rather dislike the term "transperitoneal" as applied to the old operation, the old classic cesarean section. I think we ought to distinguish two general types of cesarean section—the high and the low. The high cesarean, the old classic cesarean, through the fundus of the uterus, we might call fundal cesarean sections. The new operations—they are old, too, but recently revived—are the low, sometimes called the cervical or lower uterine segment cesarean section. Nowadays, when a man is going to do an abdominal delivery, he should say he is going to do an abdominal delivery. Which form of cesarean section or abdominal delivery will he make? The fundal or corporeal, the high, old-fashioned classic, or the new operation, the low cesarean? If the low operation, he has two courses: the extraperitoneal, in which the peritoneal cavity is not opened, and the low cervical intraperitoneal, or transperitoneal—better intraperitoneal—in which the incision is made in the lower part of the abdomen and the lower part of the uterus, but the fundus is not invaded. Dr. Copeland's operation is the old classic cesarean section. I am opposed to hurrying in cesarean sections. I once delivered a baby in thirty-nine seconds. It is absolutely foolish and fatuous.

Thirty-nine seconds is not time enough to open the abdomen and deliver the baby in safety to the mother or child. Why should we hurry? The few minutes of anesthesia are negligible. If we take longer time we avoid the dangers of hernia. We are able to make that incision through the skin and fascia, and shell out the rectus muscle from its sheath, and make the incision in the peritoneum in another place, so that later on the muscle acts as a dam to prevent hernia. We can therefore guarantee the woman's future comfort and ability to work. Secondly, we can take time to extract the baby, and thus prevent postpartum hemorrhage. The uterus should have time to contract and retract. Then, too, a sufficient number of layers of suture should be applied. It is a positively demonstrated fact that on the fifth day postpartum the uterine cavity is invaded by bacteria from the vagina. Even if we do not have a leaky line of incision, in the presence of bacteria this point becomes of danger to the mother. There will occur adhesions in the milder cases and peritonitis in the severer cases. The doctor has had twenty-nine cases without a death, but he will have a death sooner or later. I have had one. Everybody who does a large number of cesarean sections will have a death even in a clean case. We must prevent those accidental deaths, and one of the strongest precautions against them is a properly applied uterine suture. I use four, and sometimes five rows of sutures in the uterus, taking care to apply them so that they do not produce necrosis. I suture each layer of the uterine muscle individually. No one can put those sutures in in the time specified by the essayist. You will be surprised at the number of cases of rupture of the uterus, not reported in the literature. One or two rows of sutures hastily applied cannot guarantee against this accident. Every once in a while we hear of a death from postpartum hemorrhage after cesarean section. Rapid emptying of the uterus conduces to postpartum bleeding. Most of the evils of the old classic cesarean section are avoided by the new low cervical operation.

Dr. Gordon G. Copeland, Toronto, Canada: I am afraid I went a little too fast in my paper to bring out the point Dr. Ward called to your attention. I do use very careful aseptic technic and use sterile "drapes," and have them pinned into place with towel clips before I start the operation. Possibly an inch width of the skin shows when I start the incision. The amount of anesthesia is one of the big factors in the danger of postpartum hemorrhage. If you cut down the anesthetic, the uterus will contract very much better. The elimination of needle holders cuts out practically ten minutes of time. If Dr. De Lee puts four or six layers of sutures in the uterine wall and uses a needle holder to put them in, it means he must use from two to three hundred separate operations to adjust that needle

holder to the needle. That takes time. That time is not spent in suturing the uterus. It is spent in fussing with the needle holder. I wish to make emphatic the point that I have never tried to make a record. These fast times have been made with great safety. I take a minute, sometimes much longer, to get the baby out. I go slowly where the danger points lie. I make speed, but not at any loss of essential details of technic. I am not a fast operator, and I get this great saving in time simply by thorough work and the elimination of nonessentials. I agree with Dr Brown about elimination of packing, and so forth. I agree with Dr. De Lee as to the title of the paper and his method of using the low operation for potentially or actually infected cases. I am not discussing that operation at all. I am discussing Dr. De Lee's operation, which is an excellent operation, and much better than the high operation in those cases in which it is indicated. As to suturing the uterus in several layers, we cannot say in advance in a given uterus how many layers we ought to put in. What is important is good apposition. If you can get good apposition with only one layer, it is sufficient. To put more in is to invite trouble from catgut. Bland Sutton has shown conclusively the value of a minimum amount of foreign body in muscles. I believe that if we can get thorough apposition with one or two layers, that is far better than putting in two or three more layers, and saves a great deal of time to the patient, and that time means absence of danger of postpartum hemorrhage and a much smoother convalescence. No attempt is made to attain speed at the risk of safety. But I do get speed by eliminating, if I may use the word, "junk," and by having thorough cooperation with the operating team.

INTRACRANIAL BIRTH TRAUMA OF THE NEW-BORN

FROM THE STANDPOINT OF THE OBSTETRICIAN

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Within the last decade an extraordinary amount of information concerning intracranial birth lesions has been offered in the medical literature of Europe and of this country. In the light of this newer knowledge, prevailing conceptions in regard to the causation of these injuries, their diagnosis, and their immediate, and especially remote, effects on the infant are in urgent need of thorough revision. In a large monograph dealing with the birth injuries of the new-born child, to be published in the near future by D. Appleton and Company, I shall have ample opportunity to discuss thoroughly also the subject of traumatic intracranial lesions. I feel confident that in this volume I shall be able to justify fully many of the statements which here are made seemingly in a rather apodictic manner. However, the allotted fifteen minutes offer no chance for quoting references or arguing mooted points, if one endeavors to present, within this limited time, an adequate answer to the one question, most important to us as obstetricians: To what extent can the obstetrician prevent such intracranial birth lesions?

The terms intracranial birth lesions and intracranial birth hemorrhages rather generally are employed promiscuously. For merely clinical purposes this may be justifiable, because the clinical importance of these lesions is almost limited to the hemorrhages. But this lack of discrimination in using the terms obscures much that is significant and essential for the correct understanding of the causation of these lesions. Only since

Beneke's special method of opening the skull of the new-born at necropsy (published in 1910) has been more generally adopted, has the important problem of the tentorial lacerations, which are not necessarily associated with hemorrhage, been adequately appreciated. A study of all the larger statistics on the incidence of intracranial birth lesions establishes the noteworthy fact that with every succeeding year, figures, based on a large amount of necropsy material of new-born infants, show an ever increasing percentage of such findings. During the last few years they range as high as from 30 to 40 per cent. of postmortem examinations of all infants, that were either stillborn or that died within the first few days of life. It has become evident that such traumatic tentorium tears may represent only accidental findings in no way related to the actual cause of death. Experimental studies have furnished additional information especially concerning the mechanical causes of dura lesions.

ETIOLOGY

The problem of the etiology of the most important of intracranial birth traumatisms, which are the dura lesions, can be presented briefly, thus: These injuries, practically without exceptions, primarily are due to definite mechanical causes. The dura mater is stretched, and with it the large blood sinuses and particularly the veins emptying into them, are pulled and eventually are ruptured. This stretching to the breaking point is either the result of excessive overlapping in the sutures of adjoining skull bones, or is effected by the strong compression of the head in one direction, chiefly the transverse, which leads to a compensating elongation of the cephalic diameters in the other direction, the longitudinal. Excessive overlapping of the parietal bones endangers the longitudinal sinus and in particular its contributory veins on one side. Excessive overlapping in the lambda suture in a similar manner comprises the transverse sinus and its veins. The

change in the configuration of the fetal skull by lateral compression in the process of molding stretches the falx. Exaggerated tension is most likely to impair its integrity at its weakest point, that is, where the falx fibers divide to form the upper blades of the tentorium on either side. Thus the sinus rectus itself, or large veins, may be torn.

This conception of the primarily mechanical causation of the intracranial birth traumatism satisfactorily accounts for the high incidence of serious lesions after breech extractions, and also after forceps extractions, especially if the forceps have been applied to overcome an existing disproportion between head and pelvis. This mechanical conception emphasizes the almost specific danger of the sudden compression of the head. However, this still leaves unexplained the undeniable fact, evidenced in every new study of the problem, that in from 20 to 25 per cent. of the cases examined at necropsy even most extensive destructions are discovered in infants born spontaneously, after quick labors, normal in every respect. The literature contains many records of fatal intracranial hemorrhages after cesarean sections, or in the second born of twins. An acceptable interpretation also of such occurrences is now available in the assured fact that there are definite conditions which clearly *predispose* the infant to such traumatic lesions. Most important among them evidently is prematurity, apparently responsible for an abnormal fragility of the dura and of the vessel walls. Syphilis in this connection positively plays a rôle only so far as it is responsible for the premature termination of pregnancy.

We also know that outside such predisposing causes there are *contributory* factors involved in the etiology of intracranial birth lesions, and in particular of birth hemorrhages. Most momentous among these contributory factors undeniably is a hemorrhagic diathesis of the new-born. It seems obvious that the rupture even of the smallest vessel, of no significance under

normal conditions, in the presence of delayed blood clotting will permit the gradual extravasation of enough blood to cause clinical symptoms to appear later, often several days after birth, or finally to cause death.

Another contributory factor of no mean importance has been found in improper manipulations of the new-born during resuscitation. To swing the seemingly asphyxiated baby after the method of Schultze or to manipulate it with the head hanging down, as is so often done, cannot fail to prove detrimental in the presence of an intracranial injury. The charge has been made, and undeniably with some justification, that the almost unavoidable lateral compression of the head during swinging, if unintentionally too brusque, in itself may become responsible for a tentorial tear. A few words must be said in this connection concerning the relation of asphyxia to intracranial hemorrhages. The commonly expressed opinion that the congested state of the brain vessels in asphyxiated new-born infants is the most important direct cause of their rupture, at least in this form, is untenable. This claim is chiefly based on the frequent observation at necropsy of small hemorrhages in serous and mucous membranes, generally considered pathognomonic for asphyxiation. Reference has been made to the rôle played by hemorrhagic diathesis as a contributory cause, and this newer knowledge throws a different light on the significance of these coexisting petechial hemorrhages. The conclusion seems fully justified that in a definite percentage of these cases the intracranial hemorrhage in the main is only a local expression of the underlying hemorrhagic diathesis. Very enlightening in this respect and almost conclusive as scientific proof must be regarded an observation made in the case of the death of a second born twin. His blood showed a distinct delay in clotting time. In the surviving first born twin the blood clotting time was found to be normal. Undoubtedly, not a few infants are in an asphyxiated

condition at birth because an intracranial, probably an infratentorial, hemorrhage is embarassing the respiratory center in the medulla. In them, attempts at resuscitation necessarily will fail. It is most likely that the clinical diagnosis of the cause of death will be asphyxia. Practically none even of the elaborate recent statistical classifications of the causes of stillbirth and early deaths tabulate specifically the cases of intracranial lesions. In view of their high frequency, as established by routine postmortem examinations, it seems fair to assume that practically all of them are included in that always large figure representing asphyxiation as the cause of death.

Summarizing the various facts mentioned in the foregoing paragraphs I can say in regard to intracranial birth injuries that (1) they are produced by the mechanical exaggeration of the physiologic process of molding, resulting in excessive or sudden compression of the fetal skull; (2) they are prone to occur in the course even of a normal labor if prematurity predisposes the infant to traumatic lesions; and (3) they are necessarily aggravated by a hemorrhagic diathesis or by inappropriate manipulations during resuscitation.

From this point of view it seems feasible to offer definite suggestions to the obstetrician, observance of which will tend to lessen his own responsibility in the causation of such injuries.

FORCEPS

Any marked disproportion between head and pelvis renders especially rapid forceps extraction extremely dangerous to the child. The least possible amount of compression will be secured if the blades are applied as closely as possible, corresponding to the transverse diameters of the head. If the handles of the forceps are not lying in close approximation, they must be steadied in their position to avoid their compression during extraction. During the progress of the extraction the normal sequence of changes of position of the

head in relation to the various planes of the pelvic canal must be strictly followed. The extraction should be made slowly to permit the gradual molding of the head. It is definitely established that sudden compression of the skull is infinitely more dangerous than long continued compression.

BREECH PRESENTATIONS

In breech extractions the aftercoming head must be kept in extreme flexion and its passage through the pelvic canal must be managed exactly in conformity with the normal mechanism of the second stage. It is important, near the end of the extraction, to avoid strong pressure of the squama of the occiput against the symphysis in the attempt to save the perineum. The commonly prevailing opinion that haste is required to preclude unduly prolonged compression of the cord is in need of modification. In the special technic of podalic version, as advocated by Potter, his urgent advice to extract slowly, seems one of the outstanding features.

PREMATURE LABOR

The evident vulnerability of the premature infant makes it necessary to avoid any severe or abrupt compression of the skull. In these cases, pituitary extract, forcing even a small head through an incompletely dilated cervix or through a rigid vulvar ring, may prove disastrous to the child. Large doses of pituitary extract endanger the child even in birth at term, especially when employed to overcome mechanical difficulties.

PROTECTION OF PERINEUM

It seems plausible that extreme efforts to protect the perineum against rupture may play a rôle in the causation of intracranial lesions, and especially of tentorial tears. Most harmful in this respect proves the attempt to push the head through the vulvar ring between uterine contractions by strong pressure made against the forehead of the child either over the per-

ineum or with a finger introduced into the rectum. This maneuver pushes the occiput forcibly against the subpubic arch. Injurious probably also is an asymmetrical pressure against the perineum, if exerted more strongly over one parietal bone than over the other, thus straining the falx in an oblique direction. Passage of the head through the vulvar ring is best retarded by pressure with the palm of the hand over the entire exposed surface of the fetal head. Any one familiar with the etiology of traumatic intracranial lesions will resort most readily to an episiotomy.

RESUSCITATION

All brusque maneuvers must be avoided during the resuscitation of asphyxiated new-born infants. If the asphyxiation is not due to an intracranial injury, clearing of the pharynx, skin stimulation and artificial respiration, carefully done, in most cases will be sufficient to establish respiration.

COMMENT

This modern conception of the causation of intracranial traumatisms during birth, in my belief, places on the attending obstetrician further obligations. Strict observance of the various suggestions made in the preceding paragraphs might materially reduce the occurrence of such injuries, but it evidently now has become the obvious duty of the obstetrician also to recognize their existence at the earliest possible moment. It is impossible to enter here even into the briefest discussion of the symptomatology of these lesions. In the effort to improve their prognosis, which at the present time is very unsatisfactory, the essential task for the practitioner consists in familiarizing himself thoroughly with the early symptomatology so that proper therapy can be instituted without delay. There are, however, at least two procedures of significant value which he can immediately apply.

In every case of suspected brain lesion, which in practice almost means in every new-born infant that

obviously does not behave normally, he should at once attempt to determine at least roughly whether the infant's blood appears strikingly slow in clotting. He will do no harm, but he is likely to do much good, if he will promptly inject human or horse serum whenever in his opinion there is unusual delay. The second procedure, less simple, but still almost free of danger if carefully and skilfully done, consists in a spinal puncture. The presence of blood in the spinal fluid in many, though not in all, instances will prove the existence of a hemorrhage. Puncture with withdrawal of blood not only enables the obstetrician to secure competent counsel promptly, but represents the first step in a most advantageous and useful therapeutic procedure in relieving harmful pressure on certain brain centers.

CONCLUSIONS

The information at present available concerning the causation of traumatic intracranial birth injuries makes it incumbent upon every physician attending women in labor, to accept these principles: During forceps and breech extractions all excessive and brusque compression of the head must be avoided. Special caution must be applied in managing premature labors. All violent manipulations must be eliminated in the resuscitation of asphyxiated new-born infants. The diagnosis of an existing intracranial injury should be made at the earliest moment. Whenever such an injury is even only suspected, the clotting time of the infant's blood must be ascertained and a spinal puncture performed, both as a diagnostic and as an early therapeutic measure.

Metropolitan Building.

ABSTRACT OF DISCUSSION

DR. ISAAC A. ABT, Chicago: While we all agree that forceps operations, and the various obstetric devices may contribute to the occurrence of intracranial hemorrhage, nevertheless, there are patients who tend to bleed and bleed spon-

taneously, irrespective of any instrumental interference or any force. And those are the babies Dr. Ehrenfest spoke of as having general hemorrhagic diathesis and as tending to bleed spontaneously. I agree with him. The number of cases is large, and they are of the greatest importance. Rodda showed that many babies are born with a markedly increased coagulation time; that instead of coagulating in from two to nine minutes, the coagulation time is increased to thirty minutes, or even hours; and these babies tend to bleed not only in the cranial cavity, but also in the various viscera and organs. In other words, they are potential bleeders, and even the slightest trauma may produce hemorrhage in these infants. Indeed, they may bleed without much of any trauma. So far as the diagnosis of meningeal hemorrhage is concerned, it is not always easy. One usually relies on the protuberant fontanel. Nervous symptoms, some paralysis, a baby that is not hungry, does not nurse, who has some nystagmus, who cries or jerks in a peculiar manner—all these things tend to corroborate, or at least to influence our minds toward, the diagnosis of meningeal hemorrhage. But sometimes with these symptoms more or less present, meningeal hemorrhage may be doubtful. The baby may be toxic or sick, or it may have hemorrhage in some other part of the body. I have seen babies with hemorrhage in the suprarenal who presented all the symptoms. In another instance, the necropsy disclosed an infantile form of encephalitis. And in yet another case no meningeal hemorrhage was found. Lumbar puncture has some slight therapeutic value. In a tiny baby it is difficult to perform. Only the most expert can do it. Blood may be obtained without any reference to its presence in the cranial cavity. Therefore I am very doubtful about the diagnostic value, or even the therapeutic value, of such puncture. Some of the foreign clinics show that from 30 to 40 per cent, of all babies that die die from meningeal hemorrhage. As to treatment: When there is any doubt, blood serum or horse serum should be given, or one of the hemostatic agents. The hemorrhage is light at first. If you wait, the damage that is done to the cerebral cortex and cells is in exact proportion to the amount of hemorrhage that takes place. Consequently, if there is any sign of meningeal hemorrhage, inject at once, and often, if necessary. On account of the severity of these lesions and the tragic lives these poor infants have to live, operation should be considered. That operation should be, if possible, a craniotomy. The mortality is high; nevertheless, the operation is justifiable.

DR. HERMAN SCHWARZ, New York: Handling the child may cause these hemorrhages. We must prevent prematurity if we want to prevent these hemorrhages. The premature child has no hemorrhagic diathesis, but the prematurity causes the bleeding of these children. Perhaps we can recognize these cases earlier, and be able to do something. Every child

when born should be tested for its hypotonicity. Hemorrhages that occur in the posterior fossae are more likely to cause tonic spasms. Whether the child takes the breast well is a very important differential factor in convulsions of the new-born. If the child takes the breast well I am not so worried that it might be a hemorrhage in the brain. If the child does not take the breast well, one should look for symptoms outside as well as in the brain that may cause convulsions. I agree with Dr. Abt in the difficulty of lumbar puncture. This idea of getting blood and making a diagnosis of hemorrhage is extremely far-fetched. Although 40 per cent. of the necropies show intracranial hemorrhage, the diagnosis is very often made when such a hemorrhage is not present; and many of the diagnoses of intracranial hemorrhage and death would be cleared up if we could perform a necropsy. I do not think that there is a definite hemorrhagic diathesis in an appreciable number of these cases. These are not necessarily premature infants that have a hemorrhage of the brain. What we want to do is to prevent prematurity, and then we will prevent that type of hemorrhage.

Dr. W. W. Brown, Rochester, N. Y.: It has been stated that one of the principal causes of this hemorrhage is prematurity. I believe that to be true, but the cause of prematurity is probably going to be found to be the cause of the hemorrhagic diathesis, so-called, in the baby. In our wards every baby has the coagulation time taken within from six to twelve hours after it is born. Every baby that shows a prolonged coagulation time is given human serum. I do not believe in laboratory hemostatics or in horse serum. I get 30 or 40 c.c. of blood serum from the mother or any one else, and 10 c.c. is injected intramuscularly every three or four hours for four or five doses. Not knowing what the cause may be, I have also learned to associate prolonged jaundice, that does not clear up on clearing out the intestinal tract, with these hemorrhagic conditions.

Dr. Joseph B. De Lee, Chicago: The time has come to sound a warning against the too active trend in modern obstetrics. This might sound a little bit antagonistic to some of my own pronouncements, but they were intended for the maternity hospital men, who have all the help and facilities for doing advanced work. There is a striking difference between the work of the man under circumstances that do not permit the highest kind of technic, and the work of the man situated where he can give the patient all the benefits of his art. Hemorrhages in the new-born are on the increase. The advent of pituitary extract has been one of the most unfortunate things for new-born babies. Hardly a week goes by that some doctor does not tell me about a death in his practice directly due to the use of pituitary extract before the delivery of the baby. I have even felt that it would not be undesirable to pass a law forbidding the use of pituitary

extract before the child is born. Another factor which is causing hemorrhage in the new-born is the use of forceps, the overcoming of resistance by brute force. Forceps are used too much—and not enough. Discrimination is wanting. A bizarre practice, recently exploited, is the routine delivery by version and extraction. It is threatening to have a dangerous spread, in spite of the published fact that it has a fetal mortality, in the hands of its exponent, of nearly 8 per cent. Evidently, such interference in natural labor is perilous to the child, and it explains the large number of hemorrhagic diatheses which caused the excessive mortality reported. Rodda did not explain the cause of the hemorrhagic diathesis. We did not always have so many cases of hemorrhagic diathesis. Among the known causes are prematurity, syphilis, hemophilia in the mother, influenza and malaria. Asphyxia and traumatism are two potent causes of hemorrhage. To prevent death from this hemorrhagic diathesis in the baby, we must prevent asphyxia and traumatism. One of the forms of traumatism is a hard resisting perineum, with a prolonged second stage of labor. Dr. Ehrenfest has well recommended the use of episiotomy to relieve this. I think every man ought to be qualified to perform the operation of episiotomy well, to save the baby from the effects of compression of the brain. As to the idea of labor being abnormal: Everybody considers labor normal. It is a natural function. It is natural for women to have babies. No one would say that it is a disease to have babies. But does not so-called normal labor produce damage? That natural labor causes injury to both mothers and babies, nobody can deny. If a normal labor hurts the baby, we say that was a pathogenic action of normal labor. If a baby has his head crushed in the door we say that the crushing was pathogenic, and the state of the baby's head we say is pathologic. If the baby's head is crushed against a hard perineum by natural labor the crushing is pathogenic. Anything pathogenic is pathologic, and labor is pathologic, but that does not mean it is a disease. It is disease producing. Why do I insist on that view of labor? To elevate the practice of obstetrics in the minds of physicians so that the best men will engage in it, and to elevate the practice of obstetrics in the minds of the laity, so that when laws are made by our legislators, proper dignity may be accorded the function of childbearing.

Dr. Gordon G. Copeland, Toronto, Canada: What is your view as to the relationship between hematoma and intracranial hemorrhage? Is intracranial hemorrhage due to changes in the blood that would warrant opening the skull to relieve possible tension? I have found it practical to give whole blood from the mother or father in these hemorrhagic cases in the new-born, injecting it into the intrasagittal space of the child. I have had some very good results from that procedure.

DR. HUGO EHRENFEST, St. Louis: As to spinal puncture, I am fully aware of its difficulties and possible danger. Nevertheless, any one who follows the literature cannot fail to be impressed by the results that have been obtained. I am far from recommending that procedure for all the men doing obstetric work. As to the responsibility of the obstetrician for a correct diagnosis, I had to avoid the problem of diagnosis in this paper; it would by itself make an interesting paper. I want to point out to you just the one thing. If the surgeon or pediatrician is called to see the child that has had several convulsions, that is unconscious or comatose, he is at a great disadvantage if the man attending the case has not observed a certain symptomatology that has manifested itself previously, e. g., a lack of ability of the child to nurse, twitching which began in this extremity or that gradually went to another. A facial paresis, present when the consultant appears, means a great deal if the attending physician can assure the surgeon that this facial paralysis was not there when the child was born, and developed only later. If these early symptoms are watched carefully by the attending physician, there is often observed a sequence of symptoms that correspond almost exactly to the further distribution of extravasated blood from the primary focus. As to the hemorrhagic diathesis: I am not surprised to see it form the main point of discussion. Hemorrhage is the essential factor in the clinical symptomatology; but I tried to point out that the hemorrhage does not give the real clue to the causation of the injury. The frequency of tentorial tears without any hemorrhage emphasizes the mechanical factors as the underlying primary causes of intracranial birth lesions. The hemorrhagic diathesis, then, represents only a very important contributing factor, resulting in a large hematoma, even if the primary mechanical lesion is only slight. The obstetrician unfortunately has been persuaded by the neurologist that it is the long compression of the head that proves so dangerous to the child in after life. There cannot be any doubt that the sudden forcible compression is the more dangerous factor. There is a relation between cephalohematoma and intracranial hemorrhages. Small hemorrhages under the periosteum are found, but they are of no particular significance. They represent accidental necropsy findings, but never cause the death of the child. I purposely eliminated the entire subject of perforating injuries from my paper.

PUERPERAL MASTITIS

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AND
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The appearance of acute infection in the nursing breast is sufficiently frequent, even in well regulated hospital services, to receive careful attention. The occasional termination of such an infection in mammary abscess is an obstetric calamity. Therefore, we believe that without apology, in spite of a number of excellent recent articles on this subject, further consideration of this infection may not be untimely.

As the title "puerperal mastitis" suggests, we propose in this discussion to devote our attention to those disturbances which occur in the early weeks post partum. The hospital supervision of maternity patients in many cases ceases, provided there has been a normal puerperium, after two weeks. Therefore, many late infections are not seen unless reported back for treatment or detected in the follow-up work.

Our present hospital system keeps in touch with the patients until three weeks post partum.

Undoubtedly, the care of the breasts in the first two weeks has much to do with the avoidance of later infection. From the relatively rare occurrence of breast disturbance in cases in which nursing has been well established, it is certain that much of the morbidity from breast infections will be prevented by proper guidance and instruction of the nursing woman.

The importance of this condition cannot be overestimated. A sharp infection of breast parenchyma,

even if quickly subsiding, may cause a termination of successful lactation. There is profound nervous disturbance in many of the cases. It is conceded that some of these inflammations may leave an irritation that will be the cause of later malignant growth. A substantial percentage will suppurate, with the sequelae of operative interference, destruction of breast tissue, more or less protracted convalescence, and profound nervous depression. To this is added loss of function for the time and probably in later pregnancies. In hospital or private practice, such an experience causes much dissatisfaction.

As this is a condition due to infection, it is our duty to inform ourselves of the normal incidence of this complication and to strive for the irreducible minimum.

There has been too much vagueness both in definition and in diagnosis of mastitis. Some teachers have failed in definiteness. When promptness of recognition and treatment weigh so much, this should not be.

An attempt to find the various recorded incidence of mastitis revealed wide variations in statistics, from Jewett's statement of from 5 to 6 per cent., to the statistics collected from varying sources by Norris in the *American Journal of Obstetrics* for July, 1918, in which he quotes a range of from 0.5 to 4 per cent. Gardiner [1] quotes Webringhaus with 2 per cent., and Fehling, 3.18 per cent.

Our statistics were compiled from a consecutive series of 2,000 patients delivered at the Woman's Hospital. There were fifty-seven cases diagnosed as mastitis, an incidence of 2.8 per cent. Our patients are kept in the hospital for fourteen days post partum. Nine of these cases occurred after the date of customary discharge; three of them were readmissions.

CAUSES OF INFECTION

The causes of breast infection may be summed up as germ contamination plus diminished resistance. The

1. Gardiner, J. P.: Am. J. Obst. **80**: 506 (Nov.) 1919.

old theory of "catching cold" is disappearing from the textbooks, but is still difficult to extirpate from the lay mind. The cause of the persistence of this tradition probably lies in the initial chill, which is the first symptom recognized.

The presence of the contaminating germ, especially *Staphylococcus albus,* in the normal maternal ducts, has caused much emphasis to be laid on the theory that milk stasis with increased germ activity has permitted bacterial invasion of the tissues. Accordingly, much zeal on the part of nurses in the use of massage or breast pump has in the past been encouraged to avoid such a development.

It is believed that a saner view of the situation is now prevailing. As breasts in which nursing is suspended or not attempted rarely show mastitis, it is more probable that manipulation of distended breasts may diminish the natural resistance of the tissues and increase the liability to infection.

The contamination of nipples by outside organisms is probably the commonest method of infection, especially in those of the severer type. Damage to the nipples from cracks, fissures or erosions undoubtedly favors the entrance of these germs. Infectious contacts may be from fingers of attendants or from fingers of the patient herself, possibly contaminated by handling lochial pads or from the nightdress or breast binder. De Lee, in his textbook, emphasizes the importance of the infant as the source of infection, whether from sprue, pharyngitis, coryza, ophthalmia, or pustular infections—especially of the face. To this list, might be added paronychia.

Our statistics showed 22.75 per cent. of infantile complications were recorded in the histories of these mastitis cases, as against 10 per cent. as a general nursery record. Of these, eight were conjunctivitis cases; three, pustular, and two, coryzas.

Some years ago, a private patient of mine suffered repeated mastitis attacks in different parts of both breasts, which disappeared after the healing of some mildly inflamed but discharging forceps injuries on the cheek.

The chance of the nursling's transmitting infection from an inflamed to a normal breast by changing the child immediately from the affected side to the other is so great that the nurse and mother must be instructed to avoid such a sequence. Blood stream infection is probably rarely encountered.

TYPES OF INFECTION

The types of infection vary from parenchymatous to primary interstitial. There is a phlegmonous type, usually with severe reaction, and there may be the slowly developing abscess with but slight initial rise of temperature. Another type, exceedingly mild, is that due to infection of the tubercles of Montgomery, the end-result of which is the areolar abscess. Rarely, the submammary abscess may result.

The early diagnosis of the infected breast is indispensable for successful treatment, as the opportunity for help is greatest in the early stages. There are usually the chill or chilliness, malaise, and headache; the rapid rise of temperature, the localized tenderness of a segment of one breast, and possibly early redness —especially in the superficial interstitial cases. The infected breasts may show general congestion.

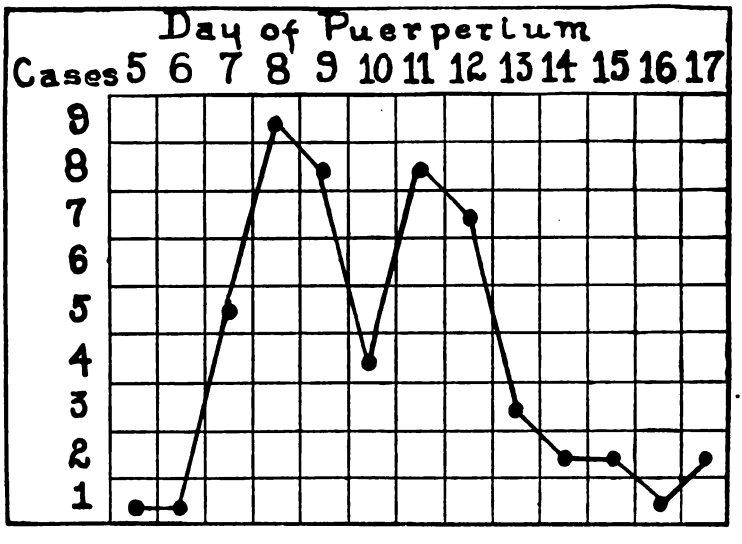
The onset of the infection in our cases showed that from the seventh to the twelfth day was the commonest time of incidence.

In our experience, the eighth day is the one peculiarly liable to show a beginning mastitis.

The local pain is not always marked. In confirmation of the diagnosis, palpation to elicit the area of tenderness may be necessary. On the other hand, nervous symptoms are pronounced. There is often a

severe occipital and vertex headache. The rise of temperature is sudden, and may, considering the local degree of inflammation, be disproportionately high—from 104 to 106. These symptoms are explained by the close relationship of the organs of lactation to the central nervous system, and by the ready absorption of toxins from the breast.

The differential diagnosis between this condition and distended breasts ought to be simple usually: first,



Day of onset of infection.

because of the time of the onset of the infection, that is, in the second week; second, because of the localization of the process, and last, because of the very slight rise of temperature that is likely to occur with distention. It is true that occasionally with uncomfortable breasts, in the presence of some sapremic temperature there may be a temporary obscurity in the diagnosis. The lay term "caked breasts" is partly responsible for confusion in diagnosis. There is also the general

impression that congested breasts are the forerunner of infection.

Even among the profession, we find a careless use of this term. The term "caked breasts," if used at all, should be applied to those that are hard, congested, or distended, while mastitis should be clearly visualized as a local infection and inflammation due to germs, and with possibilities of suppuration.

Usually the course of the disease tends toward rapid resolution. The fever, from its initial high peak, under proper treatment promptly and progressively declines until at the end of twenty-four or forty-eight hours it has reached normal. Some local tenderness may continue for several days. If the fever does not disappear, pus formation is probable. Should the temperature fail to show a steady decline or develop recessions in the initial twenty-four or forty-eight hours, either there is pus formation or the infection of another segment of one of the breasts.

FREQUENCY OF OCCURRENCE OF BREAST ABSCESS

The frequency of the occurrence of breast abscesses is variously given by different authorities. Baer and Reis report from the Michael Reese Maternity Hospital, 0.23 per cent. occurrence in normal times, with a rise to 1.74 per cent. during the influenza period. Weibringhaus reports 0.21 per cent.; Fehling, 0.6 per cent.; Norris, 0.45 per cent. Our own statistics showed 0.4 per cent.

The occurrence of suppuration in proportion to mastitis attacks is given by Weibringhaus as 8.33 under Baer treatment to 16 per cent.; Fehling, 19.3 per cent., our own statistics, 14 per cent.

The abscess may be of slow formation, and its recognition thereby delayed for some days after the beginning of infection, and even after the subsidence of fever. If deeply placed, fluctuation is late in appearing, the only symptom being an indurated lump, gradu-

ally increasing in size. In slight cases, the formation of pus may be in the larger ducts near the nipple, where, at times, a cure has been effected by the systematic emptying of these ducts.

TREATMENT

In approaching the subject of the treatment of mastitis, one almost hesitates to advocate his method. The fierce conviction with which various authorities urge treatments of great diversity and give different indications argues Nature's response to be kind under many different handlings. Teachers seem to have varying theories, and in this connection, it is interesting to note Baer and Reis'[2] article, with their careful study of the technic of breast care in twenty-nine different maternities.

They note "the great diversity of opinion is found in those conditions in which prophylactic treatment is most imperative, i. e., the treatment of pathologic nipples, of breast congestions, lymphangitides, and threatened abscesses," and suggest that possibly a study of the varous treatments may serve to unify the kind of treatment in a particular condition.

Is there a possibility of developing a standard treatment for mastitis? Probably not, until some one can bring forward satisfactory statistics in a large number of cases which will carry conviction.

In prophylaxis, there cannot be such a wide divergence of opinion. That prenatal care, with advice, especially to the primipara, in regard to cleanliness, and in the case of depressed nipples massage is helpful, no one can doubt. After birth until the milk comes in, very brief nursings, from three to five minutes, with intervals of from four to six hours, is important. Cruel damage to the delicate epithelium is often accomplished before the need for nursing exists. To diminish the acute congestion of the beginning of

2. Baer, J. L., and Reis, R. A.: Surg., Gynec. & Obst. **32**: 353 (April) 1921.

lactation, the lavish fluid diet so often given by nurses to hurry up the coming in of the milk should be forbidden. With the bugbear of distended breasts as a cause for infection cast from our minds, the prophylaxis in mastitis resolves itself into prevention of trauma to breasts and nipples and to the elimination of contact infection as far as possible.

Appreciable lesions of the nipples are not the only cause of infection, for breast abscess occurs not infrequently with the nipple apparently intact, while many patients with severely damaged nipples show no breast inflammatory reaction.

Our technic in the case of damaged nipples is to use a constant dressing of either tincture of benzoin or bismuth and castor oil, from 1 dram to 1 ounce, or the lead nipple shield. The last is the most valuable of all. With a damaged nipple, all nursing should be through a glass nipple shield. In cases of bleeding, nursing is temporarily discontinued.

In the prevention of contact infection, the nipples are, when not in use, covered by a sterile compress or pad of gauze, 4 inches square, held in place by adhesive strips. This does away with the necessity of a binder to protect the nipple, besides providing a sterile dressing which remains in place unless removed by the nurse or physician. The effect on the patient is educational, establishing a *noli me tangere* attitude toward the nipple.

Further prophylaxis involves the rapid clearing up of all infantile infections, and in case of one-sided mastitis, the prohibition of consecutive nursing from the infected side to the normal one.

In our first 1,000 cases, in which the particular protective dressing described above was not employed, the mastitis incidence was thirty-six cases, with five abscesses. In the last 1,000 cases, coincident with the adoption of this dressing, the mastitis incidence was twenty-one, with three abscesses.

The treatment of the mastitis, as soon as diagnosed is a cardinal point in success. The diversity of treatment may be seen in the accompanying table.

DIVERSITY OF TREATMENT OF MASTITIS

	Massage	Pumping	Nursing	Tight Binder	Cathartics	Restrict Fluid	Cold	Heat
De Lee.....	No	No	No	Yes	Yes	Yes	....	....
Williams.....	...	Yes	No	Yes	....	....	....	....
Jewett.....	No	No	....	Yes	Yes	Yes	....	....
Cragin.....	Yes	Yes	Yes	Yes	....	....	Yes	....
Norris.....	No	No	Yes	Yes	Yes	....	No	Yes
Michael Reese Hospital.....	Yes	Yes	No	Yes	Yes	Yes	Yes	....

Certain therapeutic measures seem to have almost universal acceptance. These are the use of cathartics and the employment of a binder for pressure and support. The limitation of fluid in the diet is generally accepted also. An overwhelming majority use ice locally until the presence of suppuration is suspected. The moot points are those which involve the emptying of the breasts by massage, pumping or nursing.

From the study of Baer and Reis' table, it would seem that the statistics of those continuing nursing were about the same as those who stopped it. We believe that the breasts, in the absence of nipple injury, are most safely emptied by the infant, and that the continuation of nursing increases the chance of successful lactation. If, therefore, the attendant believes in the value of depletion at this time, the infant may be the safest agent for accomplishing this purpose. Massage and pumping must be most carefully and gently employed, but may be necessary to supplement the child's nursing.

The failure in the treatment of simple mastitis is evidenced by the proportion of cases in which there is pus formation, and it is by this result that the therapy must stand or fall. When the physician can show a lower incidence than one half of one per cent. in abscess cases in women who have been followed for a period of three months, that treatment should be

regarded with respect. Moreover, the ratio of pus cases in proportion to the mastitis cases should be of value.

It is obvious that the mastitis incidence in a hospital in which the patients are discharged on the eighth or tenth day post partum will be insignificant, and statistics based on such short observation valueless.

When the presence of suppuration is suspected, a change from cold to heat gives comfort and hastens localization. All breast manipulation should cease, including nursing. Free incisions with counter drainage by rubber tubes and irrigation with surgical solution of chlorinated soda (Dakin's solution) will hasten recovery.

CONCLUSION

We would urge: (1) more effort toward the prevention of contamination in the first and second weeks of the puerperium; (2) general training of staff and nursing force, that the earliest recognition of infected breasts may be achieved; (3) prompt treatment of the infection by some rational method which will stand the test of figures showing a minimum of suppurative termination.

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ABSTRACT OF DISCUSSION

DR. HOWARD T. SWAIN, Boston: I wish to emphasize the importance of prophylaxis in these cases. Few cases of breast abscess are not preceded by some difficulty in nursing. It is of the utmost importance to be careful in putting the baby to the breast in the early days following its birth. Long nursing of the nipple from which nothing is obtained is probably one of the most common causes of injury to the nipple, which goes from bad to worse, and forms the opening in the tissues through which infection enters. With reference to protecting the nipple, I believe the lead nipple shield is a great aid, not only when the nipple is small, so that the baby is unable to get hold of it, but also when the clothing moves about and irritates the surface of the nipple. The lead nipple shield will prevent such disturbances. If we regulate the nursing of the baby, being sure it goes to

the breast at long intervals and for only a few moments, until the nursing is established, we shall have far fewer breast abscesses. With reference to the treatment, massage should be absolutely omitted. I do not believe that massage of a tender breast should ever be allowed. Also, after we have put ice to the breast it is a great mistake to put the baby to the breast without allowing sufficient time for the freezing or chilling which the ice causes to pass away. It is very wrong to take the ice cap off the breast and put the baby to the other breast immediately, as is so often done. There should be an interval of twenty minutes or half an hour after the removal of the ice cap before the baby is put to the breast. With reference to fluctuation as a determination of the presence or absence of pus, I have never found that of any special importance, because it is so hard to make out in breast tissue. I do believe that the presence of edema over the area is important. Up to the time that edema of the skin appears there may be a question as to whether or not actual suppuration is going on. But once definite edema of the skin over the inflamed area appears, there is no question that pus is present, and the sooner it is evacuated the more rapid will be the recovery of the patient.

Dr. Franklin A. Dorman, New York: I do not want this discussion to end without approving the occasional use of massage. The baby is a good source of depletion in mastitis, but intelligent massage may be necessary, even the occasional use of the breast pump. The appearance of edema, while a rather late sign, may be misleading, because it is not invariably a sign of suppuration. It may indicate a superficial inflammation rather than a deep one.

PUERPERAL ANEMIA

WALTER MANTON, M.D.
DETROIT

The contention of Sir William Osler[1] that all anemias contingent upon pregnancy and the puerperium may be divided into four classes is, in the main, sound. He states that there are met with: (1) cases following various types of postpartum hemorrhage, or (2) instances of toxic or hemolytic anemia during pregnancy, or (3) the postpartum variety following a smooth delivery, or (4) those types dependent upon frank postpartum sepsis.

Disregarding in this discussion the disturbances of hemorrhagic origin or those due to demonstrable sepsis, we have left two types which hold several features in common. Indeed, the low hemoglobin and irregularly shaped and proportioned red cells, the fever, the boisterous heart sounds, the dyspnea, the pallor, the edema, may be found on either side of the confinement, postpartum or antepartum. Clinical observation at the Herman Kiefer Hospital has led us to believe that these two anemias are identical. When the diagnosis remains unestablished until after delivery it is because the symptoms have not been sufficiently salient for its earlier recognition.

The outstanding characteristics of this disease suggest: (1) a so-called pernicious anemia—a hemolytic anemia; (2) a malignant endocarditis; (3) a sepsis of cryptic origin. Precisely as in the pernicious type, the etiology of the puerperal type is profoundly obscure. It intervenes like eclampsia before or after the emptying of the uterus, and, like eclampsia, is frequently not modified by this procedure. Thus it may be that the

1. Osler, William: Brit. M. J. 1:1, 1919.

anemia is instituted by a toxic material elaborated by the products of pregnancy. Against this is the laboratory fact that the serum will not hemolyze red blood cells. Evidence in the liver of red blood cell destruction is common to these two malignant anemias. According to Schmidt,[2] who has seen eleven of the puerperal cases, the blood picture is quite uniformly similar to that of the pernicious variety. But he believes that they may be differentiated in that the puerperal type discloses fewer macrocytes. Certain it is that the patients themselves have the same appearance. There is the lemon yellow skin without marked loss of panniculus; there is the unmistakable posture of weakness. But, unlike the idiopathic type, which delights in remissions, the puerperal type is distinctly progressive, unless terminated by the one effective therapeutic measure—transfusion. This procedure is wasted in idiopathic anemia.

Because of the high temperature, the rapid pulse and the astounding murmurs heard over the precordia, many of these puerperal cases are mistaken for cases of malignant endocarditis. Moreover, to percussion, the heart is enlarged laterally to one or both sides. The diagnosis can be established only after a study of the history of the case, the realization of the ante or postpartum condition, the inspection of the blood, and the consideration of the course of the disease.

Undoubtedly, many cases of puerperal anemia are considered cases of sepsis. The converse of this is also true; witness the instance reported by Richard Cabot in which a patient, treated for anemia, at necropsy disclosed a diphtheritic membrance in utero. In spite of these confusions in ante mortem diagnosis, the case of essential anemia shows no evidence of sepsis at necropsy; nor is there any growth following culture of the heart or peripheral blood. In common with sepsis, puerperal anemia exhibits a high temperature

2. Schmidt, H. B.: Surg., Gynec. & Obst. **27**: 596, 1918; J. Michigan M. S. **20**: 92, 1921.

and pulse rate. There may be a leukocytosis, but more often a leukopenia obtains. Recently, Hugh Cabot has been successfully treating low grade sepsis (including tuberculosis) by transfusion, thinking that the blood forming mechanism is thereby readjusted. Whatever mechanism is operative following transfusion in puerperal anemia, the results are highly satisfactory.

REPORT OF CASE

An ignorant Polish woman, aged 44 years, was brought to the hospital in an ambulance, giving the history (through an interpreter) of having undergone five pregnancies within fifteen years, including a postpartum infection lasting two months following the last delivery. She looked sick. The face was pale, very yellow and puffy; the eyes were full of alarm, and the respirations were markedly increased; the temperature was 101.6; pulse rate, 120. Pneumonia was considered, but a diligent search of the lungs showed nothing. Cardiac dulness slightly increased to the left and right. There was a rough blowing murmur heard strongest over the mitral region, and transmitted over the entire precordia. The abdomen of a seven months' pregnancy exhibited a vertex posterior presentation with a fetal heart pulse, 160. Otherwise the abdomen was not remarkable. There were the usual perineal and cervical lacerations following multiple pregnancies, with a mere semblance of mucous discharge. The feet and shins pitted on pressure. The reflexes were somewhat exaggerated or normal. A trace of albumin, some hyaline casts and an occasional red cell were found in the urine at entrance. This urine picture did not change materially during the patient's stay in the hospital. The pulse and temperature were elevated for five days, after which they dropped. During a period of three weeks her condition continued to improve under injections of iron. She was up and about the ward. The heart condition remained much the same. There were some dyspnea and an occasional vomiting spell. With these symptoms on the increase, and a new rise of temperature, it was finally deemed advisable to terminate the pregnancy. A bag and pack introduced into the cervix established pains the following day, and the patient was delivered of a living child after a few hours of mild labor. In spite of this, she became progressively worse. A week after delivery her temperature had reached 105, pulse 150. Often there were no remissions in the morning. The chart conveyed no definite picture. The red blood count was 740,000; the white, 4,500; the hemoglobin, 30 per cent.; anisocytosis, polycytosis, but no nucleated red cells; polymorphonuclears, 79 per cent.; large mononuclears, 14 per cent.; small mononuclears, 4 per cent.; eosinophils, 4 per

cent. There were chills, sweats and periods of vomiting. Two days later, Dr. Crump gave her an indirect transfusion of 350 c.c. of blood, and the red count rose to 1,000,000 twelve hours after transfusion. Altogether, the patient had three transfusions aggregating 1,000 c.c. of blood. Together with this, she was given iron intramuscularly and Fowler's solution by mouth. The temperature fluctuated between 100 and 106, and the pulse between 100 and 130 for more than a month after delivery. A half dozen blood cultures were uniformly negative. During this time there were periods of almost fatal weakness, and attacks of delirium requiring extra precautions to keep the patient in bed. For several days she was partially blind, differentiating light and darkness only. Occasionally, there was a slight, foul, nonhemorrhagic vaginal discharge which was readily cleared up with a douche. Examination showed the uterus to be well involuted and not at all sensitive. It was not until the end of the first month following delivery that any nucleated red cells were found. The blood picture then was: hemoglobin 40 per cent.; red blood cells, 520,000; white blood cells, 1,200; polymorphonuclears, 77 per cent.; small mononuclears, 16 per cent.; large mononuclears, 8 per cent.; anisocytosis, polycytosis, polychromatophilia, many winged forms and a few normablasts. From that time on, the blood picture improved very rapidly, and one month later the hemoglobin was 75 per cent.; red blood cells, 2,500,000; with the nucleated red cells rarely in evidence. The patient was sent home in reasonably good condition, her child well and gaining weight satisfactorily on a formula.

COMMENT

The study of this case and of other cases reported in the literature liberates several striking points: the occurrence of the disease among women who have born several children; the advent of the symptoms either antepartum or postpartum; the exhibition of chills, fever, vomiting and prostration without demonstrable sepsis; the blood picture, which, by reason of its absence of macrocytes, and the occasional presence of leukocytosis, differentiates puerperal anemia from primary pernicious anemia; the peculiarly vicious heart murmurs; the apparent need for revision from a bad to a guarded or a favorable prognosis since the introduction of newer curative measures, and those measures which consist first of transfusion and then the forcing of iron and arsenic, in an environment of fresh air.

ABSTRACT OF DISCUSSION

DR. GEORGE R. MINOT, Boston: I have had occasion to study some of these cases of anemia occurring in pregnancy. Though the blood of the type of cases Dr. Manton refers to can be distinguished from true idiopathic pernicious anemia, it in all respects resembles the blood of acquired hemolytic jaundice. Recent observations show that the blood in at least some of these cases has an increased fragility of the red cells to salt solution, which is what one finds in acquired hemolytic jaundice. If a patient with familial or acquired hemolytic jaundice becomes pregnant, she does not necessarily become worse during pregnancy. When the baby is born, she still has hemolytic jaundice and an abnormal blood. In contrast, cases of hemolytic anemia of pregnancy usually become progressively worse. If these patients do get well, which is often the case, the blood returns to normal. I agree fully with Dr. Manton that women with hemolytic anemia of pregnancy said to have developed after delivery have had the disease before delivery, and the diagnosis has been missed. These cases should never reach the stage where the hemoglobin is 30 per cent. without the patient having been delivered. In four cases seen within two years, the hemoglobin has been about 50 per cent., and termination of the pregnancy appears to have permited them to respond satisfactorily without the need of transfusion though transfusion was prepared for in all. In a fifth case, the woman had about 25 per cent. hemoglobin. She was very sick and died shortly after delivery. The family refused to allow this patient to be transfused. When the hemoglobin reaches 30 per cent. or below, transfusion is necessary.

DR. WALTER W. MANTON, Detroit: The points I intended to bring out were that the condition may be confused at first sight with so-called malignant endocarditis by reason of the tumultuous heart sounds which most of the patients exhibit; that it shows a blood picture quite similar to pernicious anemia, and that it is often confused with true sepsis. A certain number of these cases which, at first sight, seem to be puerperal anemia have exhibited, later on, a septic focus. On the other hand, I have seen cases, anemic in type, with a high temperature, which at necropsy have revealed absolutely nothing referable to sepsis. There will be a very dark liver engorged with products of red cells and perhaps some free clots in the heart, but neither the heart blood culture nor blood culture from the periphery of the body shows any evidence of bacterial invasion. Regarding the termination of pregnancy as a curative measure, it is statistically true that such a procedure has very litle influence on the prognosis of the disease. Following the delivery of the fetus these patients may grow progressively worse, or they may get well but with the evidence mostly toward their growing progressively worse. Whether or not the ordeal of labor has anything to do with this, I do not know.

PREGNANCY AFTER NEPHRECTOMY

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BROOKLYN

It has long been considered a settled fact that after recovery from the operation of nephrectomy has been complete and the compensatory changes taken place in the remaining kidney, the expectancy of life is the same as for a person who possesses two good kidneys. But, in the case of a woman in the child-bearing age who is nephrectomized, what happens if pregnancy supervenes? This becomes a very important question particularly, nowadays, when the urologic as well as other surgeons are very keen on the diagnosis of kidney lesions and very eager to perform nephrectomy. Indeed, nephrectomy is done from three to four times more frequently today than it was ten years ago. However, notwithstanding this fact, pregnancy is of rare occurrence, owing, it would seem, to a general lack of knowledge regarding the capability of the remaining kidney. It has long been thought by the average physician, as well as by many specialists of obstetrics, that nephrectomy should preclude pregnancy; and therefore, they have without further investigation or thought on the subject persistently recommended the termination of the pregnancy, as soon as the diagnosis could be established. In what is to follow I shall endeavor to show that such advice in the majority of instances is erroneous and that in properly selected cases pregnancy after nephrectomy is a perfectly safe proposition.

Most obstetricians are agreed that pregnancy is a pathologic process; and that there is an increased load

thrown on the kidneys during pregnancy and labor, is at present universally recognized. Whether these statements are accepted in toto or not, the fact remains that a woman on whom nephrectomy has been performed and who subsequently becomes pregnant undoubtedly subjects her remaining kidney to a certain amount of excess work. But, it may be argued, the remaining kidney compensates for the loss of its mate, becomes hypertrophied, and within from twenty to twenty-five days, as determined by Tuffier,[1] Paolo-Fioro, Simon[2] and others, gives the individual all the services required of two kidneys. In fact, in a large number of nephrectomized subjects, hypertrophy of the remaining kidney is already developed even before the ablation of the diseased kidney; and urinary function is therefore not materially decreased for any length of time. This explains why nephrectomy for "pus kidney," for example, where no parenchyma remains, does not cause an immediate appreciable decrease in the urinary output, whereas, in early unilateral renal tuberculosis where there may be considerable parenchyma remaining, there is a marked decrease in urinary function until the remaining kidney is able to compensate for the loss of its diseased fellow. Physiologists have known for many years that the total amount of renal tissue possessed by each individual is considerable in excess of his dire needs, three or four times, which is another reason why otherwise healthy nephrectomized subjects "carry on" in such a remarkably efficient manner.

Pousson[3] called attention to the fact that:

> There exists only a very small number of histologic examinations of the remaining kidney, but all those which have been made show that the increase in volume relates less to the interstitial tissue than to the glandular tissue, so that we have under consideration a condition of true hypertrophy. And furthermore, chemical and histologic examination of the urine, as well as the tests with mythylene blue, phenolsul-

1. Tuffier: Thesis Montville, Paris, 1905.
2. Simon, quoted by Hartman (Footnote 5).
3. Pousson: Am. J. Urol. 9: 113, 1913.

phonephthalein, phlorizin and with other substances designed to give information as to the renal permeability reveal in the majority of cases a complete return of renal function; and this is just as true when nephrectomy has been performed for the infectious diseases, e. g., tuberculosis, as when it is performed for conditions which do not affect the anatomic elements of the kidney, e. g., trauma. Urea, the chlorids, the phosphates and uric acid are eliminated in normal quantities and undergo all the variations which elimination, exercise, fatigue, etc., are capable of causing. The urine is free of albumin. In the sediment examined there can be found no leukocytes, blood clots or renal epithelium.

But such is not always the case, for in a goodly number of subjects that have been nephrectomized one can find, even many years after the operation, urinary trouble both quantitative and qualitative. Crabtree[4] and Cabot, for example, observed that twenty-nine patients out of ninety-nine cases of nephrectomy for renal tuberculosis showed albumin in the urine—twenty-five a trace and four a large amount—from five to fifteen years after nephrectomy. In fact, the same authors state that in about 35 per cent. of their cases of renal tuberculosis there remained legacies of the disease in the form of abnormal urine and persistant symptoms, e. g., pus in urine, traces or cloud of albumin, irritable bladder, etc. But it must be remembered that renal tuberculosis is in many respects the most serious of all kidney affections, which fact would lead one to look on renal tuberculosis with grave suspicions in those cases in which pregnancy is likely to supervene. In fact, such authorities as Hartmann,[5] Bar, Baldwin,[6] Spire and Boeckel,[7] Stoeckel[8] and others are agreed that a woman who has had nephrectomy for renal tuberculosis must be looked on with apprehension if pregnancy supervenes, but state that if a period of from two to four years has elapsed with-

4. Crabtree, E. G.: Surg., Gynec. & Obst. **21**, December, 1915.
5. Hartmann: Rev. prat. d'obst. et de pediat. **25**: 259, 289, 1912; Travaux de chirurgie anatomoclinique, Series 4, 1913, p. 455; Ann. de mal. gén.-urin., January, 1911.
6. Baldwin, H. A.: Ohio State M. J., Nov. 15, 1912, No. 11.
7. Spire, A., and Boeckel, A.: Ann. de gynec. et d'obst. **40**: 129-192 (March) 1913.
8. Stoeckel: Deutsch. Ges. Gynec., Halle, May, 1913; Surg., Gynec. & Obst., **17**: 1913.

out the reappearance of symptoms, pregnancy may be allowed to take place with safety. Likewise, Kümmel[9] of Hamburg maintains that the same may be said regarding pregnancy after nephrectomy for malignant tumors of the kidney; but other authorities, notably Israel,[10] hold that pregnancy should never be allowed to progress after nephrectomy for renal malignancy. Believing, as I do, that malignant disease of any organ will, in all probability, recur "sometime, somewhere," it would seem wise to recommend the termination of a pregnancy occurring after nephrectomy for unilateral malignant disease of the kidney.

So far we have considered pregnancy after nephrectomy only in those cases in which there may be recurrence of the trouble for which nephrectomy was performed, therefore contraindicting the continuance of the pregnancy; but there are conditions for which nephrectomy must be done and in which there remains no likelihood of a reoccurrence of the trouble, such, for example, as pyonephrosis, nephrolithasis, trauma cysts and nonmalignant tumors. In this class of cases the prognosis, particularly as to pregnancy, is much better than after unilateral tuberculosis or malignant disease of the kidney. As has been stated above, the compensatory hypertrophy of the good kidney in these cases has usually already taken place to a considerable extent when nephrectomy is performed, so that the total urinary function is not materially decreased for any length of time following operation. It thus becomes very evident that the remaining kidney is physiologically competent and, therefore, pregnancy may supervene without danger. But suppose that a severe toxemia (pre eclampsis) or pyelonephrosis or pyelitis or an acute infection develops during the course of pregnancy after nephrectomy. Will the remaining kidney be able to carry the extra load superimposed by these pathologic states? Certainly not. Such a proposition

9. Kümmel: Berlin letter, J. A. M. A. **60**: 1474 (May 10) 1913; Therap. d. Gegenw. **6**: 529 (Dec.) 1913.
10. Israel: Arch. f. klin. Chir. **47**: 392, 1894; Folia urol., 1911, p. 529.

demands immediate interference with the pregnancy and if, as in the case reported by Broadhead,[11] the pregnancy is progressed to or beyond the seventh month, cesarian section or sterilization should be done. Where such a procedure is not feasible, the pregnancy should be terminated by that method best suited to the case in question, and instructions given to the patient for the prevention of future pregnancies. There are certain types of the toxemia of pregnancy occurring in the woman with both kidneys that clear up after the delivery of the fetus and which do not recur with subsequent pregnancies; but in the subject possessing only one kidney, it does not seem wise to permit subsequent pregnancies. Obviously enough, there may be, at any time during a pregnancy, superimposed an acute infection whose toxins would be sufficient to cause permanent serious damage to the remaining kidney, or death may supervene.

In the thirty-seven collected cases herewith reported (Tables 1 and 2), cesarian section was done at the seventh month for a severe toxemia of pregnancy plus a pyelitis; three were induced between the seventh and eighth months for impending eclampsia; and one was aborted at three months for a severe pyelitis. There are three women out of the five whose remaining kidneys show, after one to three years, permanent damage in the form of a persistant nephritis. Obviously, there can be no argument as to the proper procedure in such cases.

Castaigne [12] reports the case of a woman who had a nephrectomy as a child, grew to womanhood, married, became pregnant, and was delivered without complications. Some weeks after delivery she died from severe grip infection. At necropsy her one kidney weighed 35 gm. The renal substance was much altered and there were many diffused sclerotic lesions. Thus, despite this small sclerotic kidney, only one-third its

11. Broadhead, G. L.: New York M. J. 111: 974 (June 5) 1920.

normal size, this woman had been able to live for many years, and went through pregnancy and labor without showing any evidences of toxemia; but when the grip infection was added, she succumbed because of the renal insufficiency.

TABLE 1.—DATA IN THIRTY-SEVEN CASES COLLECTED FROM COLLEAGUES IN GREATER NEW YORK*

No. of Cases	Indications	Time Between Operation and Pregnancy	Kidney Removed		Side not Indicated
			Right	Left	
7	Pyonephrosis	2 to 12 yrs.	4	1	2
11	Tuberculosis	1 to 5 yrs.	6	4	2
1	Congenital cystic	2 yrs.	..	..	1
4	Multiple abscesses	2 to 8 yrs.	..	1	
1	Acute hematogenous infection	2 yrs.	..	1	
1	Suppurative nephritis	3¼ yrs.	..	1	
2	Pyelonephritis	1½ to 2¼ yrs.	1	..	1
15	Not given	.....	..	..	15

* It will be noted that the right kidney was removed fourteen times and the left eight times, a ratio of almost 2 : 1 for the right. In six cases the side was not indicated. In fifteen cases no data were given.

Henri Hartmann of Paris has reported seventy-four cases of pregnancy after nephrectomy. Seventy-two of these women had from one to four pregnancies after their nephrectomy, with and without complications. Two cases aborted—one after repair of ureteral fistula, one during the course of a severe pneumonia.

TABLE 2.—ALBUMINURIA IN THIRTY-SEVEN CASES

None	1+	2+	3+	4+	Boiled solid.
15	12	4	3	2	1

* Of these thirty-seven patients there were five women who had more than one pregnancy after nephrectomy: one had four with 1+ to 2+ albumin each time; two had two with 2+ to 3+ albumin each time; two had three with no albumin. Thus, there were forty-three pregnancies in the thirty-seven cases. There were five cases in this series whose pregnancies were terminated because of severe toxic symptoms. There were only eleven cases in this series that had blood pressure readings recorded, and only six of these had both systolic and diastolic.

Two patients died—one of eclampsia and one of renal insufficiency. The remaining seventy patients went to term and, in spite of prolonged labor in several cases, due to contracted pelvis and cervical dystocia, the single kidney sufficed.

12. Castaine, quoted by Pousson (Footnote 3).

Pousson compiled sixty-six cases of pregnancy after nephrectomy, in seven of which the patients aborted and fifty-nine went to full term. Of those going to full term there were several who had to be delivered with forceps or by craniotomy. There were no maternal deaths. All the mothers nursed their babies, and one mother acted as a wetnurse.

Baldwin of Columbus, Ohio, has reported six cases of pregnancy after nephrectomy without complications. One mother died three months after labor of acute pulmonary tuberculosis.

Andrews of Paris has reported the case of a woman who passed through five successful pregnancies without complications following a nephrectomy.

TABLE 3.—TWO HUNDRED CASES COMPILED FROM THE LITERATURE *

	No. of Cases	Complications	Died
Hartmann [5]	74	2	2
Pousson [3]	66	7	0
Israel [10]	29	0	0
Kümmel [9]	17	0	0
Baldwin [6]	6	0	0
Spire and Boeckel [7]	3	0	0
Andrews	1	0	0
Castaigne [12]	1	0	0
Broadbead [11]	1	1	0
Schramm †	1	0	0
Tredondani ‡	1	0	0

* In the twenty-nine cases reported by Israel there occurred thirty-nine labors without complications. The patient of Andrews passed through five pregnancies without trouble. Thus, in 200 cases there occurred 215 labors, in ten of which there were complications and two patients died.

† Berl. klin. Wchnschr., 1896.

‡ Ann. d'Obst. et gynéc.,

Spire and Boeckel have reported three cases of pregnancy after nephrectomy without complications. There was no albuminuria at any time during their pregnancies, and delivery was accomplished without difficulty. Pregnancy occurred within from twenty months to three years after nephrectomy. Lactation was not interfered with, and consequently nursing was continued without detriment to mother or child. The authors conclude that nephrectomy for unilateral renal

tuberculosis is undoubtedly the correct procedure, and that if the remaining kidney remains healthy for two or more years after operation, it is perfectly safe to allow pregnancy.

Israel, observing thirty-nine labors in twenty-nine nephrectomized women for renal tuberculosis, comes to the conclusion that pregnancy follows its normal course, that labor proceeds in a normal manner, and that lactation is not interfered with.

Kümmel investigated the late fate of 386 patients, male and female, following nephrectomy, and found that of this number there were seventeen women who had borne children after the removal of one kidney. One of these patients had a severe nephritis, and one had premature labor. The remaining fifteen women passed through pregnancy and labor without complications. Permission to marry may be given to women after nephrectomy for tuberculosis and for malignant tumors if they have remained free of symptoms for from two to four years, respectively.

There is little to be said regarding the progress of labor in the nephrectomized subject for, naturally, other conditions being normal, we would expect labor to take place in the usual manner. This it does. Furthermore, nephrectomized patients stand morphin and ether anesthesia exceedingly well, and therefore the labor may be managed in a painless manner, just as any labor should be conducted.

Choloroform should never be used for reasons which need no elucidation. It is claimed by some authorities, notably Kümmel, that such patients bear chloral hydrate, barbital and kindred drugs badly, which would to some extent inhibit the conservative treatment of eclampsia in the nephrectomized subjects.

Judging from published reports, personal communications from my colleagues, and from personal experience, lactation in the nephrectomized subject is not interfered with and consequently the mother may nurse

the baby in the usual manner. If the nephrectomy was done for unilateral tuberculosis and the mother is below par as regards her general health or signs of tuberculosis develop elsewhere in the body, then, of course, nursing should be prohibited.

The question of marriageability of the young woman on whom nephrectomy has been done may come up for consideration. What shall determine the answer? If sufficient time has elapsed since the nephrectomy to insure proper function of the remaining kidney, marriage may be allowed. If the nephrectomy was for unilateral renal tuberculosis and a complete cure has been accomplished as shown by freedom from symptoms for a period of three years or more, marriage is still permissible. If symptoms of tuberculosis in the remaining kidney or elsewhere should appear after marriage, pregnancy should not be allowed until such symptoms have disappeared and the patient has remained well for three or more years. When nephrectomy has been done for malignant tumor of the kidney, marriage is permissible; but it is very doubtful whether pregnancy should be allowed to take place. There is great likelihood of a recurrence of the malignancy at some future time, in which case the mother's life is lost and the child's future happiness materially jeopardized.

REPORT OF CASES

CASE 1.—Mrs. L. E., aged 40, German-American, tall and thin, whose family history was negative and whose menstrual history was normal in every respect, had been married eighteen years and had had two children, the oldest aged 14 years and the youngest 3 weeks. The labor and puerperium had been normal. Two miscarriages had occurred, the first in 1906 when she was curetted at the eighth week of pregnancy because her physician thought a woman with only one kidney should not continue her pregnancy, and the second in 1908 for the same reason. One operation had been performed twelve years before for acute appendicitis and chronic right ovaritis, at which time she had an appendectomy and right oophorectomy. Six months later she was operated on for right hydronephrosis. Nephrectomy was done. The wound became

infected and drained for about four months. Three months later, that is, in July, 1903, the right kidney was removed and pathologic examination proved it to be tuberculous, which explained the fistulous drainage after her first operation, six months previous. The wound after this operation healed by primary union, and following this she had a severe chronic nephritis of the left kidney which persisted for several years and finally entirely cleared up. She probably did not have pulmonary tuberculosis, for she had many physical examinations of her lungs and no signs were ever found. Twelve years after her nephrectomy (right), that is, June 15, 1914, the patient was seen by me, for the first time, eight weeks pregnant. She was very anxious to have a child, and I thought it would be safe to let her continue until some signs of kidney disturbance showed itself. The urine was negative. The blood pressure was: systolic, 135, diastolic, 100. Her general condition was good. The urine was examined every two weeks during the entire pregnancy and was negative until eight and a half months, after which there was a trace of albumin. The systolic blood pressure remained between 130 and 135, the diastolic between 90 and 100. She was confined by her family physician at full term, Feb. 4, 1915, after having three and one-half hours of labor. The delivery was perfectly normal and she remained in bed ten days. A follow-up examination, February 26, showed her to be in excellent general condition and the urine negative.

CASE 2.—Mrs. K., aged 32, Jewish, came to me with a history of having had the right kidney removed for tuberculosis eight years before by Dr. Victor C. Vaughan of Ann Arbor, Mich., and presenting a letter from Dr. Vaughan substantiating her statements. She was at this time seven months pregnant. Her urine showed: specific gravity, 1.020; trace of albumin; no sugar; no casts; pus in large quantities; no tubercle bacilli as determined by guinea-pig inoculation. She had a normal labor and an uneventful puerperium. In December, 1916, I again saw her, and at this time she had a temperature of 99.4, night sweats, loss of weight, a severe tuberculous cystitis and questionable signs of pulmonary tuberculosis. She was sent to the country and advised to remain until well. She presented herself to me, March 2, 1919, three years later, again pregnant at the eighth month. During the interim, almost three years, she said she had been in good health. The urine at this time showed a heavy trace of albumin, which persisted some weeks after delivery, but was otherwise negative. The blood pressure was: systolic, 130; diastolic, 90. She was confined, April 14, and had a normal labor and a normal puerperium. A follow-up examination, September 30, showed her to be as well as usual, her only complaint being pain in the left kidney region and general malaise. There was no cough or fever, and no loss in weight. The urine showed a heavy trace of albumin, few

casts, and considerable pus. I have examined her many times since, and her urine still shows a heavy trace or cloud of albumin and many hyaline and granular casts. The blood chemistry, taken June 5, 1921, shows: urea nitrogen, 50; urea, 107; sugar, 83; uric acid, 83; creatinin, 1.76 per hundred cubic centimeters, which means that she has a badly damaged kidney and certainly should not become pregnant again.

CASE 3.—Mrs. M. S., Irish-American, aged 24, married, mother of three children, who had had no miscarriages, and who had always been well except that she had severe bronchopneumonia four months before, was admitted to the genitourinary department of the Long Island College Hospital, March 3, 1917, with a diagnosis of chronic nephritis. After a careful survey, a diagnosis of right suppurative nephritis was made and nephrectomy performed, March 9, 1917, by Dr. Henry Morton. She was about five and a half months pregnant at this time. She made a good recovery and was discharged in good condition, April 3. She went to term and was confined at the Long Island College Hospital, July 20. The urine remained negative until the last three weeks of her pregnancy, when she had a faint trace of albumin but no casts. The baby weighed 3,820 gm. The puerperium was afebrile, and her condition on discharge was excellent. She was again admitted to the Long Island College Hospital, Oct. 23, 1918, pregnant at term and in labor. The urine showed a trace of albumin. The systolic blood pressure was 120; diastolic, 80. After six and one half hours of labor she had spontaneous delivery. The baby weighed 2,380 gm. and measured 50 cm. in length. The puerperium was afebrile and her condition was excellent on discharge. Nov. 1, 1920, she presented herself at the prenatal clinic of the Long Island College Hospital in the fourth month of her second pregnancy since the right kidney was removed in 1917. The urine was negative and her blood pressure, systolic, 115; diastolic, 85. On her return visits every two weeks the urine remained negative until Jan. 18, 1921, when she showed a heavy trace of albumin, with pain and tenderness over left ureter and kidney. January 22, four days later, she was admitted in labor to the Long Island College Hospital with a diagnosis of acute pyelitis on the left side. The urine showed a heavy trace of albumin and few pus cells but no casts. The systolic blood pressure was 100; diastolic, 48. Blood count revealed: red blood cells, 3,704,000; white blood cells, 13,940; polymorphonuclears, 86 per cent. A culture from a catheterized specimen of urine showed a small growth of *Staphylococcus aureus;* intravenous phenolsulphonephthalein, 60 per cent. in one hour. Blood chemistry showed: urea nitrogen, 10.7; urea, 22.9; uric acid, 3.33; creatinin, 1.50; sugar, 100 per hundred cubic centimeters. She continued in labor, having weak, irregular pains. Eight hours later she began to have good strong labor pains, and in two hours she delivered a premature

female child, seventh month, weighing 2,344 gm. and measuring 44.5 cm. in length. Her highest temperature was 100.6 on the third day, and following this she had no further trouble. Mother and baby discharged in good condition on the nineteenth day postpartum. The mother's urine was negative on the day of discharge. A follow-up examination, May 30, revealed the urine negative and the mother in excellent health.

CASE 4.—Mrs. M. N., aged 31, admitted to the Methodist Episcopal Hospital, July 18, 1916, at term and in active labor, had had a left nephrectomy in July, 1912, for tuberculosis of the left kidney and ureter. On admission the systolic blood pressure was 132, the diastolic 70, and the urine showed + + albumin, no casts or pus. Examination revealed the breech presenting in the left sacro-anterior position, fetal heart 132 left upper quadrant, and regular. After five hours of good labor a live baby weighing 8 pounds was delivered by the breech. Six days after the confinement the urine showed only + albumin and no casts. She was discharged in good condition on the thirteenth day after delivery, at which time her general condition was excellent and the urine negative. No follow-up examination has been made since her discharge from the hospital.

TABLE 4.—ALBUMINURIA IN FOUR PERSONAL CASES

1+	2+	3+	4+
1	1	1	1

TABLE 5.—INDICATIONS FOR NEPHRECTOMY

No. of Cases	Indications	Time Between Operation and Pregnancy	Right Kidney Removed	Left Kidney Removed
1	Tuberculosis	12 years	1	..
1	Tuberculosis	8 years	1	..
1	Suppurative nephritis	1½ years	1	..
1	Tuberculosis	4 years	..	1

COMMENT

Tables 4 and 5 show in condensed form the important data collected from four personal cases.

Of the four personal cases there was one woman who had three babies and one who had two babies after their nephrectomy. With each pregnancy there was an albuminuria of from + to + + + +. These four women had a total of seven pregnancies with seven living babies, all of which nursed.

In the four personal cases the right kidney was removed three times, the left once—a ratio of 3:1 for the right.

Table 6 shows the result of the blood chemistry in three pregnant and three nonpregnant nephrectomized women. Basal metabolism determinations were not done in any of these cases.

TABLE 6.—BLOOD CHEMISTRY

Case	Pregnant	Mg. per 100 C.c.	Case	Nonpregnant	Mg. per 100 C.c.
1	Urea nitrogen.....	18	1	Urea nitrogen.....	17.6
	Sugar.....	100		Urea.....	37.7
	Creatinin.....	1.5		Uric acid.....	3.55
				Sugar.....	125
				Creatinin.....	1.2
2	Urea nitrogen.....	10.4	2	Urea nitrogen.....	18.2
	Sugar.....	80		Urea.....	38.9
	Creatinin.....	1.3		Sugar.....	100
				Creatinin.....	1.2
3	Urea nitrogen.....	10.7	3	Urea nitrogen.....	50
	Urea.....	22.9		Urea.....	107
	Uric acid.....	3.33		Sugar.....	88
	Sugar.....	100		Uric acid.....	4.15
	Creatinin.....	1.5		Creatinin.....	1.76

Of the three pregnant women, Patient 1, four months pregnant, shows a normal urea-nitrogen, while Patients 2 and 3, pregnant seven and eight months, respectively, show a characteristic low urea nitrogen.

Of the nonpregnant women, Patient 3 shows marked real insufficiency and therefore should not become pregnant again.

SUMMARY OF TABLES

In the 200 cases compiled from the literature, there were 215 labors, in ten of which there were complications and two patients died; in the thirty-seven cases compiled from Greater New York City there were forty-three labors, in four of which there were complications and no deaths; in the four personal cases there were seven labors with no complications and no death, thus making a grand total of 265 labors occurring in 241 nephrectomized women. In the 265 labors, there were fifteen complicated and 250 normal, with only two deaths.

1. Pregnancy after nephrectomy follows its normal evolution.

2. Pregnancy after nephrectomy is but little more hazardous to mother or child than pregnancy under normal conditions, provided the remaining kidney is functioning properly.

3. Albuminuria of slight, moderate or marked degree occurs in a certain proportion of the cases of pregnancy after nephrectomy during the last four or six weeks which under appropriate treatment usually clears up. In the thirty-seven collected and four personal cases herewith reported, 60 per cent. showed an albuminuria of from + to ++++ during the latter weeks of pregnancy.

4. When nephrectomy has been performed for unilateral renal tuberculosis, it is imperative that the patient be free from symptoms of tuberculosis in the bladder, ureter, remaining kidney and lungs or elsewhere for three years or more before pregnancy is allowed to supervene.

5. Pregnancy after nephrectomy for malignant tumors of the kidney should not be allowed under any circumstances.

6. Pregnancy after nephrectomy should be terminated immediately on the advent of frank renal insufficiency, as shown by the relation of the nitrogenous products in the blood and urine.

7. The likelihood of a severe "pregnancy pyelitis" or pyelonephrosis in the remaining ureter or kidney must be kept in mind, particularly if the remaining kidney be the right, and on the appearance of either condition immediate termination of the pregnancy is demanded.

8. Labor in pregnancy after nephrectomy takes place without complications referable to the remaining kidney.

9. Lactation is not interfered with and therefore, except for special reasons, nursing should be carried on in the usual manner.

10. Marriage is permissible in nephrectomized women, provided the remaining kidney has functioned in a normal manner for one year or more. If the nephrectomy was for unilateral renal tuberculosis and a complete cure has been accomplished, as shown by the absence of symptoms in the remaining kidney or elsewhere for three years or more, marriage is still permissible.

11. Finally, there is urgent need for a more scientific and systematic study of the nephrectomized women, both in the nonpregnant and in the pregnant state. A well "worked up" report, including all laboratory methods for the determination of kidney function and urinary excretion, should be published of every case of pregnancy after nephrectomy.

Thanks are due my colleagues in the Greater City of New York for their kind cooperation in the gathering of the statistical data included in this paper. I also wish to thank Dr. J. W. Williams of Baltimore for the cases he permitted me to include in this report.

ABSTRACT OF DISCUSSION

DR. JOHN O. POLAK, Brooklyn: That nephrectomy has increased, there is no question. As a result, these women are brought to us pregnant, and the question is asked, Shall the pregnancy continue? In deciding about what shall become of the pregnancy, one very important point has to be determined: What pathologic condition was the original nephrectomy done for? The kidney is competent to take on the work of the other kidney, unless the disease for which the kidney was removed has a tendency to be bilateral. This assumption of the work of the other kidney is gradual. And there, again, an interval should occur before a woman becomes pregnant after nephrectomy. How are we to test these cases as to the competence of the remaining kidney? It is not by the phenolsulphonephthalein test, because, while there is an excess of kidney tissue in all kidneys, yet when a kidney has been diseased, if that disease has been of long standing, there has been gradual compensation, but we are not cognizant of the amount of reserve that that kidney has after it has compen-

sated. Therefore, not only shall we have to resort to the kidney concentration tests which show the reserve of the kidney, but we must also find what is retained by the blood. Another point one must remember is that normally in pregnancy the basal metabolism is materially increased; that the basal metabolism drops again when the baby is delivered, or when the baby dies. Is this kidney competent to maintain this metabolism? Statistics are of very little importance. In the cases in which the work was done thoroughly, it was interesting to note the comparison in the study of the blood chemistry in the women now pregnant and those not pregnant. And this is a very important point in determining whether this particular woman should become pregnant, because these women who have a disturbed blood chemistry, notwithstanding the fact that the kidney may have been removed for some cause which was not a bilateral condition, are in constant jeopardy because of the insufficiency of the kidney to function.

DR. GORDON G. COPELAND, Toronto, Canada: My own investigations have shown that infections are evident in about 75 per cent. of cases. Dr. Matthews has just mentioned the fact that when one is doing abdominal delivery of a viable child for preeclamptic conditions, it would be advisable to sterilize the woman. I have not had sufficient experience to criticize that, but I should just like to draw his attention to the fact, and ask his opinion, that if in view of the fact that the removal of foci of infection has so frequently been followed in subsequent labors by a comparatively normal pregnancy and labor, might it not be permissible to leave that woman for a subsequent pregnancy, instead of sterilizing her at that point? Because if that woman is toxic, seriously toxic, or in a preeclamptic condition, and that is her only baby, its chances of survival are small. Since the toxemia of subsequent pregnancies may become very much less, might it not be wise, if there is a reasonable doubt, to give the woman the benefit of the chance of a subsequent pregnancy?

DR. HARVEY B. MATTHEWS, Brooklyn: I would call your attention again to the importance of blood chemistry, and the accurateness with which it gives information regarding the efficiency of the kidney. Why sterilize in these preeclamptics? We have to remember that is the only kidney the woman has got. It is true we know that with two kidneys we have eclampsia, which does not occur with another pregnancy, depending on the type. If the proposition is put up to the woman, if she is a young woman with an only child, and she wants another one, she will take the chance. But as a general rule, I maintain that a woman with severe toxemia or preeclampsia should be sterilized.

LIST OF FELLOWS OF THE AMERICAN MEDICAL ASSOCIATION REGISTERED IN THE SECTION ON OBSTETRICS, GYNECOLOGY AND ABDOMINAL SURGERY

List of Fellows of the American Medical Association who registered in this Section at one or more of the last five Annual Sessions, together with Fellows who have subscribed for the Transactions of the Section for 1921. The figures following the names indicate the attendance at the Annual Sessions (1 indicates 1921, 0 indicates 1920, etc.). T follows names of nonattendant Fellows subscribing for the Transactions for 1921.

Corrections will be appreciated.

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Altman, J. T., cor Church and Vine Sts., Nashville, Tenn. T.
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Anderson, Emil B., 300 W. 63rd St., Chicago, 8.
Anderson, George M., Caspar, Wyo., 8.
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Baskerville, George. Greenwood, Miss., 0.

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Brennan, D. C., Akron, Ohio, 9.
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Briston, Delos J., Jr., 374 Marlboro St., Boston, 1.
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Butler, Rupert. Spring Hill, La., 0.
Butz, R. E., York, Pa., 9.
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Clark, S. A., J. M. S. Bldg., South Bend, Ind., T.
Clark, S. M. D., Cusachs Bldg., New Orleans, 6, 9, 1, 2, 3, 5, 6, 9, 0, 1.
Clark, Worth, 152 South North Carolina Ave., Atlantic City, N. J., 7, 1.
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Clarke, Mary E., 629 Main St., Malden, Mass., 1.
Clay, E. M., Renville, Minn., 8.
Cogill, Lida Stewart, 1831 Chestnut St., Philadelphia, 2, 4, 9, 1.
Cohen, Bernard, 568 Lafayette Ave., Buffalo, 9.
Cohen, Joseph P., 466 Commonwealth Ave., Boston, 1.
Cole, C. G., Maison Blanche Bldg., New Orleans, T.
Coleman, A. H., Center St., Clinton, N. J., 7.
Collins, A. N., 20 Martin Pl., Detroit, 0.
Comstock, Elizabeth, 601 Madison Ave., New York City, 7.
Conaway, Walt Ponder, 1723 Pacific Ave., Atlantic City, 1.
Condon, Joseph R., Equitable Bldg., Des Moines, 9.
Conklin, Alice I., 32 N. State St., Chicago. 6, 8, 9.
Conrad, Thomas K., Conn. Ave and Kirk, Chevy Chase, Md., 1.
Cooke, Harry T., Ferguson Bldg., Los Angeles, Calif., 0.
Cooke, Willard R., Amer. Nat. Ins. Bldg., Galveston, Tex., 9.
Cooley, William M., Peoria, Ill., 8.
Coombs, George A., 283 Water St., Augusta, Me., 1.
Coon, W. F., Caney, Kan. 3, 8.
Cooper, St. Cloud, F. N. B. Bldg., Fort Smith, Ark., 6, 8, 9.
Copeland, Gordon G., 2 St. Clair Ave. W., Toronto, Canada, 6, 1.
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Cornell, Edward L., 7204 Emerald Ave., Chicago. 8.
Cortright, C. B., 281 Halsey St., Brooklyn. 7.
Corvese, Anthony, 243 Broadway, Providence, 1.

Coté, C. R., 119 Belmont St., Worcester, Mass., 1.
Cottral, George H., Savanna, Ill., 8.
Coventry, W. A., 2531 E. Superior St., Duluth, Minn., T.
Coveny, M. A., Clinton, Iowa, 8.
Cowden, C. N., Hitchcock Bldg., Nashville, Tenn., 9, 0.
Cox, A. Caroline, 146 Massachusetts Ave., Boston, 1.
Cox, G. W., Del Rio, Tex., 0.
Craig, N. S., Jennings, La., 8, 3, 8, 0.
Crance, Charles T., 364 Payne Ave., North Tonawanda, N. Y., 0, 1.
Cranford, Roland H., Laurel, Miss., T.
Crawford, Mary M., 100 E. 17th St., New York City. 7, 8, 9.
Crawford, W. S., Marianna, Ark., 0.
Creadick, A. N., New Haven, Conn., 9.
Crile, George W., Euclid Ave. and E. 93d St., Cleveland, T.
Cronson, Reuben, 133 W. 122d St., New York City, 7.
Crowley, Daniel F., Fleming Bldg., Des Moines, Iowa, 3, 8, 9.
Culbertson, Carey, 4246 Sheridan Road, Chicago, 6, 1.
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Cummings, Howard H., 723 Church St., Ann Arbor, Mich., 8.
Cummings, John J., 53 Pleasant St., Worcester, Mass., 1.
Cunningham, S. P., Gibbs Bldg., San Antonio, Tex., 0.
Curtis, Arthur H., 104 S. Michigan Ave., Chicago, 9, 0, 1.
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Davis, Albert B., 511 Cooper St., Camden, N. J. 2, 4, 9.
Davis, Carl H., Goldsmith Bldg., Milwaukee, Wis., 5, 6, 9, 1.
Davis, Effa V., 2314 N. Clark St., Chicago. 8, 9.
Davis, E. C., 25 E. Linden Ave., Atlanta, Ga., 0, 2, 3, 4, 5. 6, 0.
Davis, J. C., Jr., Quincy, Fla., 7.
Davis, W. W., Bambridge, Ohio, 9.
Davison, T. C., Flatiron Bldg., Atlanta, Ga., T.
Dawes, Raymond, 3420 Harrisburg Road, Houston, Tex., 0.
Day, F. M., Eugene, Ore., T.
Day, Hilbert Francis, 45 Bay State Road, Boston, 1.
Deaver, John B., 1634 Walnut St., Philadelphia. 4, 6, 8.
DeCesare, Nicandro F., 57 Jackson St., Lawrence, Mass., 1.
DeLee, J. B., 5028 Ellis Ave., Chicago, 8, 2, 3, 4, 5, 8, 9, 1.
Dennison, A. E., 1355 S. Ashland Ave., Chicago, 8, 0.
DeNormandie, Robert L., 357 Marlboro St., Boston, 7, 1.
DeVelling, J. R., Laurel, Miss., T.
Devenny, Joseph H., 2 King St., Boston, 1.
Devlin, Joseph A., 114 W. 87th St., New York City, 7.
Dewey, Fred N., 117 S. Main St., Elkhart, Ind., 8.
Dicks, John F., Whitney Bldg., New Orleans, 0.
Dickson, W. F., 6200 Kimbark Ave., Chicago, 8.
Dieffenbach, Richard H., 570 Mt. Prospect Ave., Newark, N. J., T.
Diehl, Harold E., 25 Greenleaf St., Quincy, Mass., 1.
Dingman, T. A., 330 Broadway, Paterson, N. J., T.
Dodge, Roy A., McCague Bldg., Omaha, Neb. T.
Dohrmann, George, 3634 Wrightwood Ave., Chicago, 8, 0.
Dondanville, M. S., 403 15th St., Moline, Ill., 8.
Donoghue, Francis D., 864 Beacon St., Boston, 1.
Doonan, Henry E., 32 Bridge St., So. Hadley Falls, Mass., 1.
Dorman, Franklin A., 133 E. 57th St., New York City, 7, 1.
Dorrestein, C. A. M., 7927 St. Charles Ave., New Orleans, 0.
Dorsett, E. Lee, University Club Bldg., St. Louis. T.
Drayer, L. P., 301 W. Berry St., Fort Wayne, Ind. T.
Drewry, T. Ellis, Griffin, Ga., 7.
Drostenfels, Roman W., Main St., Morton Grove, Ill., 8.
Druskin, Samuel J., 107 W. 118th St., New York City, 7.
Duffield, William, Auditorium Bldg., Los Angeles. 5, 6, 8.
Duggan, James A., 315 Union Trust Bldg., South Bend, Ind., 1.
Duncan, Rex, 151 W. 6th St., Los Angeles, 1.
Dunlap, Elbert, S. W. Life Bldg., Dallas, Tex., 0.
Dunphy, Pierce J., 91 Westland Ave., Boston, 1.
Dunsmoor, Nannie C., Garland Bldg., Los Angeles. 1, 5, 8.
Durnin, Richard B., Great Falls, Mont., T.
Dutcher, Adelaide, 841 University Blk., Syracuse, N. Y., 7, 1.

Earle, C. B., Church and E. North Sts., Greenville, S. C. T.
Eastman, Joseph R., c/o Eastman Sanit., Indianapolis, Ind., 8.
Eastwood, James S., Brandon, Vt., 9.
Ebersole, J. R., Monmouth, Ill., 8.
Echols, C. M., Majestic Bldg., Milwaukee, 2, 3, 4, 6, 8, 1.
Eddy, Irving H., 844 Fullerton Ave., Chicago, 8.

Edgerton, E. S., 240 N. Belmont Ave., Wichita, Kan., T.
Edstrom, Andrew J., Concordia, Kan., 8.
Edwards, G. H., Orlando, Fla., 0.
Egan, James C., 4501 Dover St., Chicago, 8.
Ehrenfest, Hugo, 4333 McPherson St., St. Louis, 1.
Eischeid, R. J., New Albin, Iowa, 8.
Eisendrath, Daniel N., 4840 Woodlawn Ave., Chicago, 7.
Elfrink, Blanche M., 27 E. Monroe St., Chicago, 8.
Elliott, Calvin Hayes, 179 Allyn St., Hartford, Conn., 1.
Elliott, W. M., Lancaster, Ky., 0.
Ellsworth, Alice Barker, 502 John St., Kalamazoo, Mich. 6, 8.
English, Leo V., 448 Indiana Ave., Toledo, Ohio. 8.
Ernest, Elvenor, 729 Kansas Ave., Topeka, Kan. 8.
Eshleman, L. H., 2923 S. Washington St., Marion, Ind., 3, 8, 0, 1.
Everett, Eugene E., 427 Marlboro St., Boston, 1.
Eversfield, F. J., 226 W. 21st St., New York City, 7.
Ewer, Edward N., 176 Santa Rosa Ave., Piedmont, Calif. 5, 1, 5, 6, 8, 0, 1.

Fair, Robert P., 481 Beacon St., Boston, 1.
Farmer, Thos. P., Syracuse, N. Y., 9, 1.
Farnsworth, H. B., 1836 San Juan Ave., Berkeley, Calif., 9.
Farrington, W. P., Munday, Tex., 0.
Faust, Louis, Box 357, Schenectady, N. Y., 7.
Feigen, Philip H., 1400 N. Western Ave., Chicago, 8.
Fendler, Amelia, 170 W. 74th St., New York City, 9.
Fenn, T. Legare, 306 E. 43d St., Chicago, 8.
Ferguson, F. U., Gallitzin, Pa., 9, 1.
Filkins, Silas L., U. S. P. H. S., 4141 Clarendon Ave., Chicago, 7.
Fincke, Harry S., Astoria, L. I., N. Y., 7.
Finkelstein, Harry, 366 Commonwealth Ave., Boston, 1.
Finley, Caroline S., 104 E 40th St., N. Y., 7.
Fischer, Henry J., 361 W. 19th St., New York City, 7.
Fisher, John C. V., 640 Columbia Rd., Dorchester, Mass., 1.
Fisher, John M., 222 S. 15th St., Philadelphia. 6, 7, 9, 4, 9.
Fisher, Virgil L., 108 W. High St., Mt. Vernon, Ohio, 7, 8.
Fithian, J. W., 608 Broadway, Camden, N. J. 6, 9, 2, 4, 9.
Flannery, Jos. J., Equitable Bldg. Des Moines, Ia., 0.
Fleming, A. S., 2205 Newton Ave., Minneapolis, 9.
Fleming, E. R., 322 Boston Ave., Medford, Mass., 1.
Flint, Austin, 105 E. 55th St., New York City. 7, 9.
Floyd, J. C. M., 236 N. 5th St., Steubenville, O., 3, 4, 5, 6, 8, 0, 1.
Flynn, Geo. W., Nicholas Bldg., St. Louis, 6, 1.
Folkmar, Elnora C., 1730 Eye St., Washington, D. C., 9.
Follansbee, George E., Guardian Bldg., Cleveland, T.
Fooder, Horace M., Williamstown, N. J., 9.
Ford, Alice P., 1400 Chapel St., New Haven, Conn., 9.
Ford, William M., 1925 7th Ave., New York City, 7.
Forster, Robert W., 279 Broadway, Lawrence, Mass., 1.
Foscue, G. B., 1203 Columbus St., Waco, Texas, 1.
Foskett, Eben, 106 Central Park W., New York City, 7, 1.
Foster, C. S., 5718 Elgin Ave., Pittsburgh. 2, 3, 6, 9.
Fox, G. R., Moreauville, La., 0.
Fox, William E., Hotel Melter, Milwaukee. Wis., 0.
Frank, Louis, Francis Bldg., Louisville, Ky., T.
Frankenthal, Lester E., 4825 Woodlawn Ave., Chicago, 8.
Freeman, John K., 2104 W. Broadway, Louisville, Ky., 0.
Friduss, S. L., 1809 W. 47th St., Chicago. 4, 8.
Fried, Anton R., 324 Walnut St., Newtonville, Mass., 1.
Friedrichs, E. D., 474 Pine St., New Orleans, 0.
Froehlich, H. W., Thief River Falls, Minn., 9.
Fullerton, Wm. D., 465 Rose Bldg., Cleveland, 9.
Fulton, C. W., Raton, N. M., 1.
Funkhouser, Robt. M., 4354 Olive St., St. Louis, 9.
Furrer, Arnold F., 1805 Middlehurst, Cleveland, 1.

Gahan, P. F., 19 Washington St., Medford, Mass., 1.
Gale, S. S., 138 Salem Ave., Roanoke, Va., T.
Gallagher, J. F., Jackson Bldg., Nashville, Tenn., 0, 1.
Gamble, Hugh A., Greenville, Miss., T.
Garcelon, Harold W., 2 Goff St., Auburn, Me., 9, 1.
Gardiner, John P., Colton Bldg., Toledo, Ohio. 6, 9.
Gardner, Wm. S., 6 W. Preston St., Baltimore. 4, 6, 9, 0, 2, 4, 8.
Garipay, Ellsworth P., 554 Western Ave., Lynn, Mass., 1.
Garner, M. C., Arky Bldg., Meridian, Miss., 0.
Garnett, A. Y. P., 1824 Massachusetts Ave., Washington, D. C., 9.
Garver, Charles V., 526 E. Erie Ave., Lorain, Ohio, 8.
Gates, L. M., 802 Mulberry St., Scranton, Pa 1, 2, 3, 5, 9.
Gaulden, C. Lewis, 1100 S. St. Andrews Pl., Los Angeles, 8.
Gayler, W. C., Wall Bldg., St. Louis, 0.

Gazzam, Edwin Van D., Box 298, Clearwater, Fla., 7.
Gelpi, Maurice, 3601 Prytania St., New Orleans, T.
Gelser, George M., 658 Main St., E., Rochester, N. Y., 7, 9.
Gerber, Isaac, 201 Waterman St., Providence, 1.
Germann, Melinda, 1231 Main St., Quincy, Ill., 7.
Gerstein, Maurice, 466 Warren St., Boston, 1.
Getman, W. T., 135 Linwood Ave., Buffalo, T.
Gibb, W. Travis, 42 W. 75tn St., New York City, 7.
Gibson, A. D., Port Lavaca, Tex., 0.
Gibson, Gordon, 176 State St., Brooklyn, 7.
Gibson, P. Homer, La., 0.
Gilcreest, J. E., Ennis Natl. Bank Bldg., Ennis, Tex., T.
Gill, John J., 5708 Harper Ave., Chicago, 8.
Gillespie, G. B., 11 W. Liberty St., Covington, Tenn., 6, 0.
Gillette, Elizabeth Van R., 254 Union St., Schenectady, N. Y., 7.
Gilster, Arthur E., 4602 N. Robey St., Chicago, 8.
Girvin, John H., 2120 Walnut St., Philadelphia, 4, 9, 4, 9.
Gist, R. D., Amarillo, Tex., T.
Gladden, A. H., Jr., Whitney Bank Bldg., New Orleans, 0.
Gladman, Everett A., Fulton, N. Y., 8.
Gladwin, Ellen H., Ellwyn Boulder. Westerly R. I., 7.
Goethals, Thomas Rodman, 205 Beacon St., Boston, 1.
Goffe, J. Riddle, Stockbridge, Mass., 4, 5, 6, 7, 0, 2, 3, 4, 8, 9.
Goldberg, Sigmund, 508 Eagle St., Buffalo, 9.
Golden, I. J. K., 2238 W. North Ave., Chicago, T.
Goldfine, Ascher H., 3425 W. 16th St., Chicago, 8.
Goldman, Harry, 538 Warren St., Roxbury, Boston, 1.
Goldsmith, Luba R., 5802 Beacon St., Pittsburgh, 9.
Goldspohn, A., 2118 Cleveland Ave., Chicago, 4, 5, 6, 7, 0, 1, 2, 3, 4, 5, 6, 8, 0, 1.
Good, Frederick L., 95 Newberry St., Boston, 1.
Gould, A. G., 314 Litchfield Road, Akron, Ohio, 0.
Gould, Lyman K., Ft. Wayne, Ind., 9.
Graffogino, P., 731 N. Carrollton Ave., New Orleans, 0.
Gragg, V. J., Clanton, Ala., 0.
Graham, Henry J., Mishawaka, Ind., 8.
Graham, Ralph, Monmouth, Ill., T.
Grant, W. Herbert, 520 Commonwealth Ave., Boston, 1.
Grattan, James F., 24 W. 59th St., New York. 9.
Graves, Lattie, Scottsville, Ky., 9.
Graves, William P., 244 Marlboro St., Boston, 1.
Gray, Elizabeth T., 149 Warren St., Roxbury, Boston, 1.
Gray, Etta, 1056 E. 24th St., Los Angeles, 9.
Gray, Wm. B., Plainfield, N. J., 9.
Green, B. H., Warren, Ark., 0.
Greenberger, Bessie, 2016 Center Ave., Pittsburgh, 9.
Greene, Thomas F., 322 Warren St., Boston, 1.
Greene, Thos. F., 322 Warren St., Roxbury, Mass., 9.
Greenfield, Bernard W., 205 S. Orange Ave., Newark, N. J., 1.
Griffin, W. L., Albion, Mich., 8.
Griffith, M. E., Monessen, Pa., T.
Grimes, W. P., 10th and Harrison Sts., Kansas City, Mo., T.
Grisard, John P., Winchester, Tenn., 0.
Grosvenor, Wallace F., 4700 Sheridan Rd., Chicago, 8.
Grotowski, Leon, 1113 W. Chicago Ave., Chicago, 8.
Gruessner, Anthony, 151 Somerset St., New Brunswick, N. J., 7.
Guthrie, Donald, Sayre, Pa., 9.
Gwynne, Samuel C., Captain, U. S. Army, Office of the Surgeon-General, Washington, 1.
Habenicht, H. A., Equitable Bldg., Des Moines, Ia., 9.
Hahn, L. A., 111 W.Oklahoma Ave., Guthrie, Okla., T.
Halbert, William W., Corsicana, Tex., 0.
Haley, J. F., Moore Bldg., San Antonio, Tex., 0.
Hall, C. Lester, 2720 Troost Ave., Kansas City, Mo. 4, 6, 0, 3, 5, 6, 8.
Hall, Rufus B., Berkshire Bldg., Cincinnati, 9.
Haller, George J., 1084 Main St., Buffalo, N. Y., 8.
Halperin, George, 938 Ainslee St., Chicago, 8.
Halsey, W. McD., 65 W. Bridge St., Oswego, N. Y., 1.
Ham, William A., 1799 Dorchester Ave., Boston, 1.
Hammond Frank C., 3311 N. Broad St., Philadelphia, 7, 9, 4, 8, 9, 1.
Hammond, Walter C., 1308 Norwood Ave., Chicago. 8.
Hammond, W. D., 21 Yale Ave., St. Louis, 7.
Hanna, Samuel C., 5823 Second Ave., Detroit, 9.
Hannah, C. R., Dallas, Tex., 0.
Harbert, G. E., Beverly, N. J.. 2 4, 9.
Harding, Edward, 82 Chestnut St., Boston, 1.
Hardman, Margaret S., 117 Broadway, Providence, 9.
Hardt, A. F., Williamsport, Pa., T.
Hardy, Walter, Ardmore, Okla., T.
Hare, Charles H., 483 Beacon St., Boston, 1.
Hargrave, Edward T., Taylor Bldg., Norfolk, Va. 7, 9.
Harken, C. R., Osceola, Ia., T.
Harpel, Kate S., Boone Nat'l Bldg., Boone, Iowa, 8.

Harrar, James A., Hotel McAlpin, New York City, 7.
Hart, Frank E., 1200 S. Market St., Canton, Ohio. 9.
Hartley, Harriet L., 1534 N. 15th St., Philadelphia. 4, 8.
Hartshorn, W. E., 67 Trumbull St., New Haven, Conn., T.
Hartung, Henry, 722 Diversey Parkway, Chicago, 8, 0.
Harvey, William W., 114 Fenway, Boston, 1.
Haskins, H. E., Kingman, Kan., T.
Hasskarl, W. F., Brenham, Tex., T.
Hatch, L. B., 27 Deering St., Portland, Me., 1.
Hauberg, G. D., 403½ 15th St., Moline, Ill., 8.
Haun, Louis A., Holston Bk. Bldg., Knoxville, Tenn., 0.
Hauser, Charles E., 1206 Race St., Cincinnati, 1.
Haverfield, Addie R., 402, 20th Ave., N., Minneapolis, 7.
Hawkes, E. M. Z., 84 Wash. St., Newark, N. J. T.
Hayes, W. M., 1525 Calliope St., New Orleans, T.
Hazen, Roland, Paris, Ill., 9, 0.
Healy, William P., 108 E. 82d St., New York City. 7, 9.
Heany, N. Sproat, 104 S. Michigan Ave., Chicago. 3, 8.
Heath, A. G., Levy Bldg., Shreveport, 0.
Hebert, Jos. S., Maison Blanche Bldg., New Orleans, 0.
Hedges, Elles W., Plainfield, N. J., 9.
Heffernan, Roy J., 510 Commonwealth Ave., Boston, 1.
Heider, James E., 6253 Ellis Ave., Chicago, 8.
Heisel, Charles D., 3120 Burnett Ave., Cincinnati, 1.
Hellman, Alfred M., 76 E. 79th St., New York City. 7, 9.
Henderson, M. L., Majestic Bldg., Milwaukee, Wis., 8.
Henderson, W. T., 259 St. Francis St., Mobile, Ala., T.
Hendricks, W. H., Tifton, Ga., 0.
Henry, Anna W. L., 22 W. 72d St., New York City, 7.
Herly, Louis, 139 E. 66th St., New York City. 7, 9.
Hertzler, Arthur E., Halstead, Kan. 1, 4, 8.
Hewitt, Sophie B. K., 151 32d Ave., San Francisco. 5, 8.
Hewitt, William F., 7027 Euclid Ave., Chicago, 8.
Hickman, W. P., Harvey, La., 0.
Hill, Howard, Rialto Bldg., Kansas City, Mo., T.
Hill, Isadore L., 616 Madison Ave., New York City. 7, 8, 9.
Hinckley, James W., 419 Boylston St., Boston, 1.
Hintze, Anne A., The Sanatorium, Clifton Springs, N. Y., 1.
Hipke, G. A., 3021 Cedar St., Milwaukee. 8, 10, 8.
Hirsch, J. G., 5426 St. Charles Ave., New Orleans, 0.
Hirshfield, A. C., Am. Bk. Bldg., Oklahoma City, Okla., 0.
Hix, J. B., Altus, Okla., T.
Hoag, Junius C., 1725 E 53rd St., Chicago, 8.
Hoffman, Coleman L., 302 S. Ashland Ave., Chicago, 1.
Hoffman, C. S., Keyser, W. Va., T.
Hogan, E. P., 2212 Ridge Ave., Birmingham, Ala., 0.
Hogan, J. M., 159 Main St., Oshkosh, Wis., T.
Holden, Gerry R., 513 Laura St., Jacksonville, Fla., 1.
Holderith, Charles P., 802 Sixth St., New Orleans, 0.
Holland, S. P., Blakely, Ga., T.
Hollenbeck, Fred D., 1547 Jarvis Ave., Chicago, 8.
Holmes, Lydia H., Pekin, Ill., 8.
Holmes, Rudolph W., 414 Arlington Place, Chicago. 4, 8, 3, 6, 8.
Holyoke, Frank, 187 Walnut St., Holyoke, Mass., 7.
Homman, Grace Line, La Porte, Ind., 6, 1.
Honan, William Francis, 24 E. 48th St., New York, T.
Hopkins, Percival O., Bingham, Me., 1.
Hopkins, S. W., Walnut, Ill., 8.
Horner, T. E., Atchison, Kan., 7.
Hornstein, Mark, 1425 Madison Ave., New York City. 7.
Horsley, J. Shelton, 617 W. Grace St., Richmond, Va., 9.
Houck, Mary P., 816 Main St., La Crosse, Wis. 3, 6, 8.
Houghton, E. F., 5 School St., Tilton, N. H., 1.
Hovey, Walter C., Nokomis, Ill., 1.
Howard, A. P., Kress Bldg., Houston, Tex., T.
Howard, James G., 97th Ave and 118th St., Richmond Hill, N. Y. 7.
Howe, H. N., 7 Bank Row, Greenfield, Mass. 7.
Howle, Paul W., 1015 W. Franklin St., Richmond, Va., 1.
Huff, L. J., 6779½ Hollywood Blvd., Los Angeles, T.
Hughes, Eliz. M., 1924 N. 63d St., Philadelphia, 9.
Hugger, Carl C., Janeway Hall City Hospital, Blackwell's Island, N. Y., 1.
Humiston, Wm. H., Rose Bldg., Cleveland, T.
Hunner, Guy L., 2305 St. Paul St., Baltimore, 9.
Hunt, Barbara, 150 State St., Bangor, Me., 1.
Hunt, H. A., Story Bldg., Los Angeles, 0.
Huntington, James Lincoln, 311 Marlboro St., Boston, 1.
Hupp, Frank LeMoyne, 61 14th St., Wheeling, W. Va. T.
Hutchins, Henry T., 520 Commonwealth Ave., Boston, 1.
Hyde, Clarence R., 242 Henry St., Brooklyn, N. Y., 7.
Hyde, Fritz C., Greenwich, Conn., 1.
Hyde, Harold V., 483 Beacon St., Boston, 1.

Hyde, Harriet Baker, Maple and Putnam Aves., Greenwich, Conn. 6, 9.
Inge, James M., Denton, Tex., 0.
Ireland, Milton S., 23 S. California St., Atlantic City, 4, 9.
Ireland, R. Lindsey, Francis Bldg., Louisville, Ky., T.
Irving, Frederick C., 86 Bay State Road, Boston, 1.
Irwin, Emmett Lee, Charity Hospital, New Orleans, O.
Irwin, John C., Investment Bldg., Los Angeles, 6. 9.
Irwin, John R., 401 N. Tryon St., Charlotte, N. C., 0.
Isaacson, Julius E., 3512 Magazine St., New Orleans, 0.
Israelian, Agnes G., 18 Huntington Ave., Boston, 1.
Jack, Ernest S., 56 W. Emerson St., Melrose, Mass., 1.
Jack, Lewis H., 379 Austin St., W. Newton, Mass., 1.
Jackson, Delbert L., 520 Commonwealth Ave., Boston, 1.
Jackson, Frank H., Houlton, Maine, T.
Jackson, V. B., 1330 I St., Washington, D. C., 0.
Jacobs, Adolph, Maison Blanche Bldg., New Orleans, 0.
Jacoby, Adolph, 1141 Fox St., Bronx, New York City, 7.
Jameson, C. H., Hays, Kan. T.
Jameson, James W., 5 S. State St., Concord, N. H., T.
Janney, James C., 205 Beacon St., Boston, 1.
Jarcho, Julius, 53 W. 110th St., New York City, 7.
Jayne, Walter A., Majestic Bldg., Denver, 7.
Jeffries, W. G., 5300 Blackstone Ave., Chicago, 8.
Jennings, Walter B., 17 E. 38th St., New York. 7.
Jermain, Hubert F., 938 12th St., Milwaukee, 3, 6, 1.
Jewell, Henry H., Nashua, N. H., 1.
Jewell, Robt. T., Con. Realty Bldg., Los Angeles, 1, 6, 8, 0.
Jewett, William A., 380 Vanderbilt Ave., Brooklyn, 7.
Jewett, Wm. E., Jr., Adrian, Mich., 9.
Johnson, Benj. F., Miss. State Insane Hospital, Fondren, Miss., T.
Johnson, Frederick W., 167 Newbury St., Boston, 1.
Johnson, G. E., Simpson Bldg., Ardmore, Okla., 0.
Johnson, H. McC., 218 W. Magnolia Ave., San Antonio, Tex., T.
Johnson, Oscar V., Sebeka, Minn., 8.
Johnson, R. K., David Whitney Bldg., Detroit, 6, 8, 9, 1.
Johnston, H. A., Anaheim, Calif., T.
Johnstone, Mary M. S., 4219 Gladys Ave., Chicago. 7.
Jolley, Louis B., cor. Washington and Genesee Sts., Waukegan, Ill., 3, 8.
Jonas, A. F., McCague Bldg., Omaha, T.
Jones, C. L., East Bernard, Tex., 0.
Jordan, J. F., 76 Lynn St., Peabody, Mass., T.
Josephson, Michael, 658 E. 158th St., New York, T.
Joslyn, Leslie B., 43 S. 19th Ave., Maywood, Ill., 8.
Joyner, W. T., Roswell, N. M., 7.
Judge, Thomas A., 1st Nat'l Bk. Bldg., Milwaukee, Wis. 8.
Kaan, George R., 162 Aspinwall Ave., Brookline, Mass., 1.
Kane, C. J., 349 Grand St., Paterson, N. J., T.
Kapsa, Pauline R., 3857 Addison St., Chicago, 8.
Kasten, W. C., 819½ 2d St., Fort Madison, Iowa. 6, 8.
Katz, Bernard G., 4751 Drexel Blvd., Chicago, 9.
Kauders, H. Randle, 648 E. Chelten St., Philadelphia, 9, 1.
Kaufman, Victor E., Canton, O., 9.
Kearney, John H., 147 Prichard St., Fitchburg, Mass., 1.
Kearney, P. F., Great Falls, Mont., T.
Kearsley, Mary J., 5652 W. Race Ave., Chicago, 7, 8.
Keefe, John W., 262 Blackstone Blvd., Providence, R. I., 8, 9, 1.
Keenan, A. S., Flood Bldg., San Francisco, T.
Keene, F. E., The Powelton Apt., 35th and Powelton, Philadelphia, 1.
Keil, Geo. W., 218 E. State St., Columbus, Ohio, T.
Keller, S. D., 217 Oneida St., Fulton, N. Y., 8, 9, 1.
Keller, Wm. N., National Realty Bldg., Tacoma, Wash., T.
Kelley, J. Thomas, Jr., 1312, 15th St., Washington, D. C., 9.
Kellogg, Frederic LeRoy, 350 Commonwealth Ave., Boston, 1.
Kellogg, Henry K. W., 13 West Ave., Norwalk, Conn., 7.
Kelly, Howard A., 1418 Eutaw Pl., Baltimore. T.
Kelly, Walter F., 5503 E. Washington St., Indianapolis, 6, 8, 0, 1.
Kelso, George B., 807 N. Main St., Bloomington, Ill., 8.
Kemp, Robert S., Asst. Surg. (Res.), U. S. P. H. S., Office of the Surgeon-General, Washington, 1.
Kennedy, James W., Joseph Price Hospital, Philadelphia, 9.
Kennedy, Jane F., 713 Donaldson Bldg., Minneapolis, 1.
Kennedy, Wallace D., Metter, Ga., T.
Kennedy, W. H., Hume-Mansur Bldg., Indianapolis, 1.
Kent, C. M., Kenedy, Tex., T.
Kepler, Charles O., 362 Commonwealth Ave., Boston, 7, 9.
Kergan, Henry S., Oakland, Calif., 9.
Kessler, Henry B., 666 Clinton Ave., Newark, N. J., 7.
Kickham, Charles J., 31 Harvard St., Boston, 1.

Kieffer, A. R., 4480 Westminster Pl., St. Louis. T.
de Kieffer, Otto M., 5430 Harper Ave., Chicago, 8.
Kight, Rufus S., Taylor Bldg., Norfolk, Va., 9.
Kimbrough, J. A., Thomasville, Ala., T.
Kindig, Frank M., 4442 Woodlawn Ave., Chicago, 8.
King, E. L., Medical Bldg., New Orleans, 6, 0.
King, Jas. E., 1248 Main St., Buffalo. 4, 6, 9.
Kinnaird, James B., Lancaster, Ky., 0.
Kinney, Lyell C., 415 Elm St., San Diego, Calif., 9.
Kirk, Edwin G., 902 E. 55th St., Chicago, 8.
Kirkendall, B. R., 137 State St., Columbus, Ohio, 1.
Kirmse, Alvin, Globe, Ariz., 0.
Kivlin, Charles F., 1826 5th Ave., Troy, N. Y., 1.
Kleckner, Martin S., 202 N. 8th St., Allentown, Pa., 1.
Klein, Sidney, 4558 Grand Blvd., Chicago, 8.
Kloman, E. H., 44 W. Biddle St., Baltimore, 9.
Klump, Geo. B., Williamsport, Pa. 4. 9.
Knight, Charles L., 544 Columbus Ave., Boston, 1.
Knight, J. A., Orient, O., T.
Kohlhas, John J., 802 Genesee St., Buffalo, N. Y., 7.
Konrad, Frank C. W., 366 Commonwealth Ave., Boston, 8, 1.
Kosmak, G. W., 23 E. 93d St., New York City. 6, 7, 9, 4, 6, 8, 9.
Kostmayer, H. W., 5923 Freret St., New Orleans, 0.
Kraus, Dorris P., % Reformatory for Women, Framingham, Mass., 7.
Krieger, A., 716 Junction Ave., Toledo, Ohio, 7.
Kroh, Laird F., Rural Valley, Pa., 9.
Krusen, Wilmer, 127 N. 20th St., Philadelphia, 1.
Kurth, Henry A., 608 Union St., Schenectady, N. Y., 1.
LaMont, Charles A., Canton, O., 9.
Lane, Joseph L., Cobb Bldg., Seattle, 1.
Lang, John M., 1658 S. Homan Ave., Chicago, 8.
Lang, J. Mills, 4628 Prairie Ave., Chicago, 8.
Lankford, Burnley, 216 W. Freemason St., Norfolk, Va., 9.
Lanman, Thomas Hinckley, 286 Marlboro St., Boston, 1.
Lapierre, C. A., 303 Central Ave., Minneapolis, Minn., 0.
Larson, Edward M., Great Falls, Mont., T.
Lathrop, H. R., Casper, Wyo., T.
Lawley, Brace S., 177 Massachusetts Ave., Arlington, Mass., 1.
Lazard, E. M., 2867 Sunset Pl., Los Angeles, T.
Lazarus, David, 327 Central Park West, New York City, 7.
Leard, John S. H., 392 Arborway, Jamaica Plain, Boston, 1.
Leavenworth, Loyal E., 319 Tuscawaras St., W., Canton, Ohio, 1.
Lee, George Henderson, American Nat'l Bldg., Galveston, Tex., 0.
Lee, Thomas B., 622 Cooper St., Camden, N. J. 7, 9.
Leighton, Adam P., Jr., 192 State St., Portland, Maine, 7.
Leland, Forrest L., 44 Bardwell St., So. Hadley Falls, Mass., 1.
Leland, Leslie P., 238 Lincoln St., Worcester, Mass., 1.
Leo, Johanna B., 520 W. 182d St., New York City, 7, 1.
Leonard, H. O., 1115 Grand St., Kansas City, Mo., 8.
Leverone, Louise M., 346 North St., Boston, 1.
Levy, Simon C., 106 Eden St., Plaquemine, La., 7.
Levy, W. E., 7320 St. Charles Ave., New Orleans, 0.
Lewis, E. S., 124 Baronne St., New Orleans, 0.
Lewis, Louis, 119 W. 85th St., New York, 7.
Lichner, Mathilda O., 4048 N. Crawford Ave., Chicago, 8.
Lindsay, W. T., 926 Lake Court, Madison, Wis., T.
Lister, William W., 6802 S. Halsted St., Chicago, 8.
Litzenberg, J. C., 711 E. River Rd., Minneapolis. 6, 8, 2, 3, 5, 6, 8, 9.
Lobdell, Effie L., 110 N. Wabash Ave., Chicago, 9.
Lockrey, Sarah H., 1719 N. 33d St., Philadelphia, 4, 8, 9, 2, 6, 9, 1.
Locke, Eva M., 266 S. Limestone St., Lexington, Ky., 7.
Locke, Melvin, Bellefonte, Pa., 8.
Long, Wm. H., 116 S. 40th St., Philadelphia. 4, 9.
Longenecker, C. B., 3416 Baring St., Philadelphia. 4, 6, 9, 2, 4, 9.
Loomis, Frederic M., 1101 Ashmount Ave., Oakland, Calif., T.
Lorber, Herman, 306 2d Ave., New York City, 7.
Losee, J. R., 307 2d Ave., New York City. 4, 5, 6, 9.
Loucks, R. E., 337 W. Grand Blvd., Detroit, 9, 1.
Love, H. J., 704½ First Ave., E. Moline, Ill., 8.
Lovejoy, E. P., Stevens Bldg., Portland, Ore., 7, 8, 9, 1.
Lower, W. E., 11957 Carlton Rd., Euclid Heights, Ohio, T.
Luburg, L. F., 1822 Girard Ave., Philadelphia. 0, 2, 4, 9.
Luck, E. H., 402 MacBain Bldg., Roanoke, Va., 1.
Lundwall, Lawrence S. B., 81 Main St., Gardner, Mass., 1.
Luongo, F. Clinton, 119 N. Portland Ave., Brooklyn, 1.
Lyman, J. V. R., Eau Claire, Wis., T.
Lynch, Frank W., Univ. of Calif. Hospital, San Francisco, 9.

Lyon, Edward C., Jr., 583 West End Ave., New York City, 7.
Lyons, M. J., Maison Blanche Bldg., New Orleans, 0.
Lyons, S. C., Charity Hospital, New Orleans, 0.
Maby, W. J., Mechanicsville, N. Y., T.
MacCallum, Wallace P., 9 Bloomfield St., Boston, 1.
MacCarroll, D. R., 915 S. 47th St., Philadelphia. 2, 4, 9.
MacComber, Donald, 321 Dartmouth St., Boston, 1.
MacFarlane, Catharine, 5808 Greene St., Philadelphia, 9.
Mackay, Edwin H., 92 Walton St., Clinton, Mass., 1.
MacLafferty, Mayme, Crary Bldg., Seattle, Wash., 8.
Maffett, Minnie L., Wilson Bldg., Dallas, Tex., 0.
Magie, W. H., 1401 E. Superior St., Duluth, Minn. T.
Mahan, Lillian G. Bullock, 62 Ave. R., Brooklyn, 1.
Mahoney, S. A., 630 Dwight St., Holyoke, Mass. T.
Malloy, T. E., Random Lake, Wis., 7.
Mann, A. T., Donaldson Bldg., Minneapolis, T.
Mann, Fred W., Houlton, Maine, 7.
Manning, Leonard, 6506 Greenwood Ave., Chicago. 8.
Manton, W. P., 60 W. Adams Ave., Detroit. 4, 5, 6, 7, 8, 9, 0, 2, 6, 8, 9.
Manton, Walter W., 60 Adams St., W. Detroit, 0, 1.
Maple, Frank F., Cor. 61st St. and Cottage Grove Ave., Chicago. 8.
March, E. J., 322 S. Cleveland Ave., Canton, Ohio, 4, 9, 0, 1, 2, 3, 4, 6, 7, 8, 9, 0, 1.
Marcus, Leopold, 1215 Madison Ave., New York City. 7, 9.
Marcy, Henry O., 140 Sargent St., Boston. 4, 6, 7, 8, 9, 0, 2, 3, 4, 5, 6, 9.
Margeson, Reginald D., 522 Commonwealth Ave., Boston, 1.
Marion, Norman E., Big Rock, Ill., 8.
Markham, L. N., Longview, Tex., 0.
Marshall, T. J., Bardwell, Ky., 0.
Martin, D. T., 119 R. R. Ave., Donaldsonville, La., 0.
Martin, E. D., 1428 Josephine St., New Orleans, T.
Martin, F. H., 30 N. Michigan Ave., Chicago, 6, 1, 3, 5, 6, 9, 1.
Martindale, J. W., Camden, N. J., 9.
Marxer, Barney J., Du Po, Ill., 8.
Mason, James M., 1915 Sixteenth Ave. S., Birmingham, Ala., 0.
Mason, Nathaniel R., 483 Beacon St., Boston, 7, 1.
Massey, G. Betton, Sanit., 1823 Wallace St., Philadelphia. 4, 6, 7, 9, 0, 2, 4, 9.
Massey, John F., cor. Ill. and Pacific Aves., Atlantic City, N. J., 7.
Mast, B. W., % Henke Clinic, La Crosse, Wis., 0.
Mathias, D. F., Flatiron Bldg., Akron, Ohio, T.
Matthews, Harvey B., 643 St. Marks Ave., Brooklyn, 7, 1.
Matthews, O. H., Flat Iron Bldg., Atlanta, Ga., 7, 8, 9, 0, 1.
Mattison, F. C. E., 295 W. Calif. St., Pasadena, Calif., T.
Maury, John M., Bank-Commerce Bldg., Memphis, Tenn., 8, 0.
Mayes, H. W., 494 First St., Brooklyn, 7.
Mayo, S. T., Macheca Bldg., New Orleans, 0.
Mazer, Charles, 2238 Broad St., Philadelphia, 9.
McChord, R. C., Lebanon, Ky., T.
McClellan, Ben R., Xenia, O., T.
McClellan, Clarence, 1520 Olive Ave., Chicago, 8.
McClellan, Frederick C., 61 Main St., N. Canandaigua, N. Y., 1.
McClellan, G. W., Canandaigua, N. Y., 9.
McCord, J. R., 22 Springdale Road, Atlanta, Ga., 7, 0.
McCown, O. S., Memphis Trust Bldg., Memphis, Tenn. T.
McCoy, John C., 292 Broadway, Paterson, N. J. T.
McCracken, R. W., Union Grove, Wis. 8, 3, 8.
McCusker, C. J., 850 E. 29th St., N., Portland, Ore., 1.
McDaniel, R. C., Electric Bldg., Portland, Ore., 1.
McDannald, Clyde E., 100 W. 59th St., New York, 1.
McDonold, John Francis, 301 Essex St., Lynn, Mass., 1.
McDougald, John Q., 1336 Lombard St., Philadelphia, 2, 4, 9, 1.
McEwen, Mary G., 1703 Chicago Ave., Evanston, Ill. 0, 3, 8.
McGarvah, J. A., 2511 Lathrop Ave., Detroit, 9.
McGilivray, Donald E., Victoria & Vine Sts., Port Angeles, Wash., 0.
McGuire, Stuart, 1000 W. Grace St., Richmond, Va., 7.
McKenzie, Pierce, American Trust Bldg., Evansville, Ind., T.
McKesson, E. I., 2226 Ashland Ave., Toledo, O., 9.
McKinlock, John, 5412 Hyde Park Blvd., Chicago, 8.
McLean, E. R., Cleveland, Miss., 0.
McLeod, F. H., 1-13 W. Cheves St., Florence, S. C., T.
McMahon, Bernard C., 67 Maple Ave., Morristown, N. J., 1.
McMahon, John J., 148 W. 88th St., New York City, 7.
McMillan, Roscoe D., Red Springs, N. C., 7.
McNamara, Sylvester J., 369 Union St., Brooklyn. 4, 9.
McNulty, John B., Exchange Bldg., Memphis, Tenn., 0.
McNutt, Julia G., R.D., West Albany, N. Y., 7.
Mee, Lester E., 1229 Chestnut St., Wilmette, Ill., 1.
Meigs, Joe Vincent, 402 Marlboro St., Boston, 1.

Mengel, S. P., 181 S. Franklin St., Wilkes Barre, Pa., T.
Merchant, Marcius H., 114 N. Main St., Warren, R. I., 1.
Merdinyan, A. H., Pawtucket, R. I., 9.
Mesker, George H., Olivia, Minn., 8.
Messinger, M. P., Oakfield, N. Y., 1.
Metz, Arthur R., 2449 Washington Blvd., Chicago, T.
Meyers, Elmer L., 239 S. Franklin St., Wilkes Barre, Pa., 9.
Meyers, Harry L., 25 E. Washington St., Chicago, 8.
Michinard, Paul, 2104 Gen. Pershing St., New Orleans, 0.
Milbee, H. H., Marshfield, Wis., T.
Miles, Clarence C., Greenport, N. Y., 7.
Miller, Aaron B., 326 Montgomery St., Syracuse, N. Y. 7, 9.
Miller, A. Merrill, Danville, Ill., 8.
Miller, Clyde K., 461 Fort Washington Ave., New York City, 7.
Miller, C. Jeff, 1638 Joseph St., New Orleans. 6, 7, 8, 9, 0, 1, 2, 4, 8, 9, 0, 1.
Miller, Eben P. S., 4001 W. Lake St., Chicago, 8.
Miller, Fred E., 832 Milwaukee Ave., Chicago, 8.
Miller, Frederick M., 264 Genesee St., Utica, N. Y., 7.
Miller, George D., Logansport, Ind., T.
Miller, H. E., Medical Bldg., New Orleans, 0.
Miller, Lewis I., Metropolitan Bldg., Denver, 1.
Miller, Mary Thomas, 313 N. 33d St., Philadelphia, 1.
Miller, Robert P., Shukert Bldg., Kansas City, Mo., 1.
Mills, Henry M., 902 President St., Brooklyn. 9.
Miltenberger, Arthur, Johnstown, Pa., 1.
Minassian, H. A., Bankers Trust Bldg., Des Moines, Ia., 0.
Mindlin, Carl, 343 Washington St., Haverhill, Mass., 1.
Miner, Donald, 394 Bergen Ave., Jersey City, N. J., T.
Moister, Roger W., Summit, N. J., 9.
Monash, David, 4735 Michigan Ave., Chicago, 8.
Monihan, D. J., Chester, Pa., 9.
Montgomery, Daniel C., Greenley Bldg., Greenville, Miss., T.
Montgomery, E. B., Box 195, Quincy, Ill. 8, 9.
Montgomery, E. E., 1426 Spruce St., Philadelphia. 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 8, 9, 0, 1.
Montgomery, James, 4017 Crutcher St., Dallas, Tex., 0.
Moore, S. B., 811 Prince St., Alexandria, Va., T.
Moots, Charles W., 225 Michigan St., Toledo, O., T.
Moran, John F., 2420 Penn. Ave., Washington, D. C., 4, 9, 1.
Morgan, E. E., Fort Wayne, Ind., 7.
Morin, Jeremiah J., 95 N. Main St., Rochester, N. H., T.
Morris, L. C., Empire Bldg., Birmingham, Ala., 0.
Morse, Harry M., Nashua, N. H., 1.
Morton, G. V., Fort Worth Nat. Bk. Bldg., Fort Worth, Texas, 8, 0.
Morton, R. S., 63rd St. & Madison Ave., New York City, 0.
Morton, T. F. H., 53rd & 2nd Sts., North, Salt Lake City, 0.
Mosher, E. M., Glen Hall, 184 Joralemon St., Brooklyn, 6, 9, 0, 1.
Mosler, Fred H., 48 W. 89th St., New York City, 7.
Mount, Walter B., 21 Plymouth St., Montclair, N. J., 4, 9, 1.
Moulton, Allen T., 483 Beacon St., Boston, 1.
Moulton, W. Bean, 690 Congress St., Portland, Me., 1.
Mudd, H. G., Humboldt Bldg., St. Louis, T.
Mueller, E. F., Dyersville, Iowa, 8.
Mueller, George, 1020 Ardmore Ave., Chicago, T.
Muller, Fred H., 2575 Emerald Ave., Chicago, 8.
Muller, G. P., 1930 Spruce St., Philadelphia, T.
Muller, William K., 6004 Greene St., Philadelphia, 7.
Mullin, John P., 12 Clinton St., Iowa City, Iowa, 8.
Mundell, Joseph J., 1616 R. I. Ave., N.W., Washington, 1.
Munger, I. C., 1st Nat'l Bk. Bldg., Lincoln, Neb. 5, 8.
Munger, R. T., 609 Watchung Ave., Plainfield, N. J., T.
Murphy, C. H., 1323 E. Michigan Ave. Lansing Mich. 6.
Murphy, John J., 619 N. Main St., Lima, Ohio, 8.
Myers, J. F., Sodus, N. Y., 1.
Myers, William H., 402 Drayton St., Savannah, Ga., 1.
Mysel, Hymen A., Haverhill, Mass., 9.

Naegeli, Frank, Manhattan Bldg., Fergus Falls, Minn. 3, 7.
Nalle, B. C., McKinnon Bldg., Charlotte, N. C., 0.
Nash, E. N., 147 Main St., Galesburg, Ill., 8.
Neal, Harry B., Indiana, Pa., 9.
Neiffer, Milton K., Wyncote, Pa., 9.
Nelson, Daniel T., 5515 Kimbark Ave., Chicago, 8.
Nelson, Frederick L., Taylor Bldg., Ottumwa, Ia., 7.
Newberger, Charles, 3646 Douglas Blvd., Chicago, 8.
Newell, Franklin S., 443 Beacon St., Boston, 1.
Newman, Henry P., 1560 8th St., San Diego, Calif. 4, 6, 0, 1, 2, 5, 6, 8, 9, 0, 1.
Newman, J. W., 3512 St. Charles Ave., New Orleans, 0.
Newsom, E. M., 2505 Chestnut Ave., Newport News, Va., T.
Newton, Frank L., Somerville, Mass., 9, 1.

Newton, G. A., Freeport, N. Y., 7.
Ney, K. Winfield, 34 E. 64th St., New York City, T.
Nihiser, Winton M., 72 E. Antietam St., Hagerstown, Md. 4, 6, 8, 9, 1.
Noble, Nelle S., Equitable Bldg., Des Moines, Iowa, 8.
Noer, Julius, 1515 Le Roy Ave., Berkeley, Calif., 6, 8, 0.
Norman, W. S., Hamburg, Ark., T.
Normand, Jean N., 183 Hunter St., Fall River, Mass., 7.
Norris, Leonard E., 578 Broad St., Providence, R. I., 7, 1.
Norris, R. C., 500 N. 20th St., Philadelphia. T.
Nourse, L. M., S. & L. Bldg., Des Moines, Iowa, 7, 9, 0.
Novak, Emil, 26 E. Preston St., Baltimore, 9, 0, 2, 4, 6, 8, 9, 0, 1.
Novelli, Joseph A., 1011 Halsey St., Brooklyn, 1.
Noyes, Geo. B., Stone Lake, Wis., 8.
Noyes, Ira H., 210 Benefit St., Providence, 1.
Nute, Marion, 461 Washington St., Boston, 1.
Nuzum, T. W., 225 W. Milwaukee St., Janesville, Wis., 8.
Oatman, H. C., Watts Bldg., San Diego, Calif., T.
Oastler, Frank R., 170 W. 59th St., New York City, 7.
O'Brien, Minnie C., San Antonio, Tex., 0.
O'Callaghan, Mary V., 137 Pleasant St., Worcester, Mass., 1.
O'Connell, C. A., 6503 Detroit Ave., Cleveland, 9.
O'Connor, T. H., Medical Bldg., San Francisco, T.
O'Donnell, Alfred, Ellsworth, Kan., 8.
Oginiz, Philip, 1457 Union St., Brooklyn, 9.
Old, Wm. Levi, Taylor Bldg., Norfolk, Va., T.
O'Shea, David, 5009 Sheridan Rd., Chicago, 8.
Otis, Israel S., 165 Main St., Meriden, Conn., 1.
Otis, Margaret R., 6165 Champlain Ave., Chicago, 8.
Outerbridge, Geo. W., 2039 Chestnut St., Philadelphia. 4, 9.
Owen, W. Leonard, F. S. Bldg., South Bend, Ind., 8.
Padget, W. D., Lenoir City, Tenn., 0.
Paine, Alonzo Kingman, 80 Bay State Road, Boston, 1.
Pallette, E. M., 1501 S. Figueroa St., Los Angeles, 0.
Palma, Salvatore di, 647 Lexington Ave., New York City, 7.
Palmer, Sarah Ellen, 483 Beacon St., Boston, 1.
Pankey, J. H., Hodge, La., 0.
Parke, Wm. E., 1739 N. 17th St., Philadelphia, 9.
Parry, Angenette, 154 E. 37th St., New York City, 2, 5, 8, 9, 1.
Parry, Roger S., Main and Bean Sts., Washington, Pa. 7, 8.
Parsons, E. B., Palestine, Tex., T.
Parsons, Frank S., 367 Adams St., Boston, 9, 1.
Pascoe, M. W., Taft, Calif. 5, 8.
Patterson, R. M., Beaver Falls, Pa., 9.
Patton, A. G., Patton Block, Monmouth, Ill., 8.
Paulson, Mary W., Hinsdale, Ill., 7.
Pavlik, O. S., 801 Milwaukee Ave., Chicago, 8.
Payne, A. G., 603 Main St., Greenville, Miss., 6, 9, 0.
Pease, G. N., Stevens Bldg., Portland, Ore., 1.
Pelton, O. L., Jr., 102 N. Spring St., Elgin, Ill., T.
Pemberton, Frank A., 311 Beacon St., Boston, 1.
Perisho, E. E., 221 Main St., Streator, Ill., 8.
Perreault, Jos. N., Danielson, Conn., 9, 1.
Perry, Sherman, Tewksbury, Mass., 1.
Peterman, E. S., Abbeville, La., 0.
Peterson, George E., 343 Broadway, Waukesha, Wis., 8.
Peterson, Reuben, 1416 Hill St., Ann Arbor, Mich., 6, 8, 9, 0.
Pfeifer, J. P., 1572 Milwaukee Ave., Chicago, 8.
Pfeiffer, William, 368 McDonough St., Brooklyn, T.
Pfeiffenberger, Mather, Lewis Bldg., Alton, Ill., 5, 6, 8.
Phaneux, Louis E., 514 Commonwealth Ave., Boston, 1.
Phillips, Charles H., 221 Cabot St., Beverly, Mass., 1.
Phillips, Harry J., 2130 W. Broadway, Louisville, Ky., 9, 1.
Phillips, William D., Maison Blanche Bldg., New Orleans, 0.
Pierce, F. A., Dallas, Tex., 0.
Pitts, Herman C., 124 Waterman St., Providence, 1.
Plice, William A., 3828 Gladys Ave., Chicago. 8.
Pobirs, Louis J., 1208 Acushnet Ave., New Bedford, Mass., 1.
Polak, John O., 287 Clinton Ave., Brooklyn. 4, 6, 7, 9, 1, 2, 3, 4, 5, 6, 9, 0, 1.
Polk, L. L., Main St., Purvis, Miss., 0.
Pool, Henry J., Port Clinton, Ohio. T.
Popoff, Constantine, 26 Summer St., Haverhill, Mass., 1.
Porter, E. M., Great Falls, Mont., T.
Porter, M. F., Fort Wayne, Ind., T.
Porter, Wm. E., 41 W. 73d St., New York, 9.
Potter, Ellen C., 106 State St., Harrisburg, Pa., 8, 9.
Potter, Marion Craig, 1487 South Ave., Rochester, N. Y., 9, 2, 6, 9, 1.
Potter, Mary E., 305 Washington Ave., Brooklyn. 5, 6, 9.
Powers, Fred H., Crawford County Hospital, Bucyrus, Ohio, T.
Pratt, Chas. A., 60 Orchard St., New Bedford, Mass. T.

Pratt, Ezekiel, 374 Massachusetts Ave., Arlington, Mass., 1.
Pratt, George L., Farmington, Me., 1.
Prescott, Eva., 608 S. Gunderson, Oak Park, Ill., 8.
Preston, F. L., 224 W. Central Ave., El Dorado, Kan., 9.
Price, Joseph, 1452 S. High St., Columbus, Ohio, 8.
Pride, W. T., Memphis, Tenn., 0.
Priester, W. G., Scanlon Bldg., Houston, Tex., 0.
Prime, William R., 3750 Broadway, New York City, 7.
Pritzker, Louis J., 1332- 25 East Washington St., Chicago. 8.
Propper, Julius, 4502 Baker St., Philadelphia, 7.
Provosty, L. M., 821 Broadway, New Orleans, 0.
Psaki, Constantine G., 171 W. 71st St., New York City, 7.
Puls, Arthur J., First Nat. Bank Bldg., Milwaukee, 8.
Pyle, J. L., Chester, W. Va. 4, 8, 9.
Quantius, Leland F., McPherson, Kan., 8.
Quigley, James K., 400 Westminster Rd., N. Rochester, N. Y., 7.
Quillian, G. W., Hurt Bldg., Atlanta, Ga., 0.
Radcliff, Sue, 21 Morris St., Yonkers, N. Y., 1.
Ragan, O. H., Hagerstown, Md., T.
Ragland, Wilhelmina A., 115 E. 17th St., New York City, 7.
Ragsdale, W. E., Exchange Bldg., Memphis, Tenn., 0.
Rand, Richard F., 246 Church St., New Haven, Conn., 7.
Randall, H. E., Smith Bldg., Flint Mich., T.
Rathbun, Frank D., New Windsor, Ill., 8.
Ratliff, D. A., Columbia, Miss., 0.
Ratliff, H. M., 265 W. 81st St., New York City. 7.
Ratterman, Helena T., 1532 Elm St., Cincinnati, 6, 8, 9, 1.
Rawls, Reginald M., 350 W. 88th St., New York City, 7.
Reder. F. L., 6346 Pershing Ave., St. Louis, Mo., 0.
Reed, Charles A. L., 5 W. 8th St., Cincinnati. 6, 9, 2, 4, 6, 8, 9.
Reed, Wm. W., Mills Bldg., Topeka, Kan., 9.
Reese, Frank D., 16 Tompkins St., Cortland, N. Y., 4, 9, 1.
Reeves, W. P., 100 E. Capitol St., Washington, D. C., T.
Reich, Adolph, 245 W. 24th St., New York City, 7.
Reilly, John P., 215 Elizabeth Ave., Elizabeth, N. J. 2, 4, 9
Reinstein, Victor, 521 Broadway, Buffalo, N. Y., 7.
Reynolds, E., 321 Dartmouth St., Boston, 6, 7, 3, 5, 6, 1.
Rice, Florence F., 19 Pleasant St., Cambridge, Mass., 1.
Richardson, Anna G., 22 Evans Way, Boston, 1.
Richardson, Edward H., 1200 N. Charles St., Baltimore, Md. 7, 9.
Ries, Emil, 30 N. Michigan Ave., Chicago. 0, 3, 6, 8, 9.
Riggert, L. O., Lieut., U. S. Navy, Office of the Surgeon-General, Washington, 1.
Riley, Elizabeth A., 45 Bay State Road, Boston, Mass. 7, 9.
Ripley, Clarence B., Galesburg, Ill., 8.
Risk, Winthrop A., 219 Waterman St., Providence, 1.
Robb, Hunter, Winchester, Mass., 1.
Roberts, Carl G., 152 W. Division St., Chicago, 8.
Robertson, Victor A., 51 Eighth Ave., Brooklyn, 7.
Robinson, E. T., Cleveland, Okla., T.
Robinson, M. R., 950 Park Ave., New York City, 7.
Robison, Geo. E., Provo Gen. Hosp., Provo, Utah. 5, 8.
Rock, John, 374 Marlboro St., Boston, 1.
Rodger, D. R., Richmond Hill, N. Y., 9.
Roe, John C., 184 North St., Pittsfield, Mass., 1.
Rogers, Joseph D., 1400 M St., Washington, D. C., 2, 4, 9, 0, 1.
Rohr, Fred W., 4159 N. Robey St., Chicago. 8.
Rollins, C. D., 1562 Riverside Ave., Jacksonville, Fla.. 7.
Romeo, Pasquale, 5th & Orville Sts., Kansas City, Kan., 1.
Rongy, A. J., 345 W. 88th St., New York City, 2, 4, 6, 1.
Rose, Frances E., O. N. B. Bldg., Spokane, Wash., 9.
Rosenthal, Max, 26 W. 90th St., New York City, 7.
Rosenthal, M. S., 2840 St. Charles Ave., New Orleans, 0.
Ross, David, Board of Trade Bldg., Indianapolis. T.
Rossman, C. G., Hudson, N. Y.. T.
Roth, Charles R., 30 N. Michigan Ave., Chicago, 8.
Roth, Henry, 409 E. 140 St., New York, T.
Rothrock, J. L., Hamm Bldg., St. Paul, 1.
Rowland, J. M. H., 1204 Madison Ave., Baltimore, Md., 8.
Roy, B. W., Box 20, Sussex, N. J., T.
Rubel, Henry M., Francis Bldg., Louisville, Ky. 8.
Rubovits, William H., 5416 Ingleside Ave., Chicago, 8.
Rubin, I. C., 261 Central Pk., W., New York City, 0.
Ruggles, Edwin P., 420 Washington St., Dorchester, Mass., 1.
Ruggles, Ralph H., 56 Hillsdale St., Dorchester, Mass., T.
Ruisi, John E., Westerly, R. I., 1.
Rushmore, Stephen, 520 Commonwealth Ave., Boston, 1.
Russ, W. B., Central Trust Bldg., San Antonio, Tex., T.
Rutledge, C. P., Highland Sanit., Shreveport, La., 0.

Sadler, Lena K., 2748 Pine Grove Ave., Chicago. 8, 1, 6, 8.
Sagerson, Robert J., 340 Lincoln St., Johnstown, Pa., 7, 1.
Salatich, Peter B., 3202 St. Charles Ave., New Orleans, 7, 8, 9, 0, 1.
Saleeby, N. M., 88 Broad St., New York, T.
Samuel, Ernest C., 1522 Aline, New Orleans, 7, 9, 0.
Sand, Olaf, Box 26, Fargo, N. D., 8.
Sandberg, Carl L., Judge Bldg., Salt Lake City, Utah. 8.
Sandler, Frank F., Revere, Mass., 1.
Sanes, K. I., Jenkins Bldg., Pittsburgh, 4, 6, 7, 9, 0, 2, 3, 4, 6, 8, 9, 1.
Santee, D. K., Bethlehem, Pa., 9.
Saunders, Orris W., 1700 Broadway, Camden, N. J. 4, 9.
Savage, T. C., D. O'Gwynn Bldg., Mobile, Ala., T.
Sawyer, M. H., Central Life Bldg., Ottawa, Ill. 3, 8.
Scanlan, Thos. J., 161 Harvard St., Boston, 9, 1.
Schell, J. T., 2101 Spruce St., Philadelphia, 7.
Schiller, H., 5042 Drexel Blvd., Chicago, 8.
Schlink, Albert G., 10208 Euclid Ave., Cleveland, 7, 9, 1.
Schlink, Henry A., 10208 Euclid Ave., Cleveland, 1.
Schmitz, Henry, 25 E. Washington St., Chicago, 4, 5, 6, 8, 0, 1.
Schneider, G. A., 755 W. North Ave., Chicago, 8.
Schoen, Adolph, 218 E. 79th St., New York City, 7.
Schoenberg, Herman B., 490 West End Ave., New York, 9, 1.
Schram, Abraham W., 5131 Greenwood Ave., Chicago. 8.
Schuman, Edward A., 15 Pelham Road, Philadelphia, 1.
Schwab, Leslie W., 4315 Grand Blvd., Chicago, 8.
Schwarz, O. H., University Medical School, Washington, Mo., 0.
Scott, A. C., Temple, Texas, T.
Scott, Charles R., 222 7th Ave. N., Twin Falls, Idaho, 7, 8.
Scott, W. W., 313 Third St., Canton, Ohio, T.
Scull, Wm. B., 3024 Richmond St., Philadelphia. T.
Seeligmann, Gustav, 53 East 72d St., New York City, 7.
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